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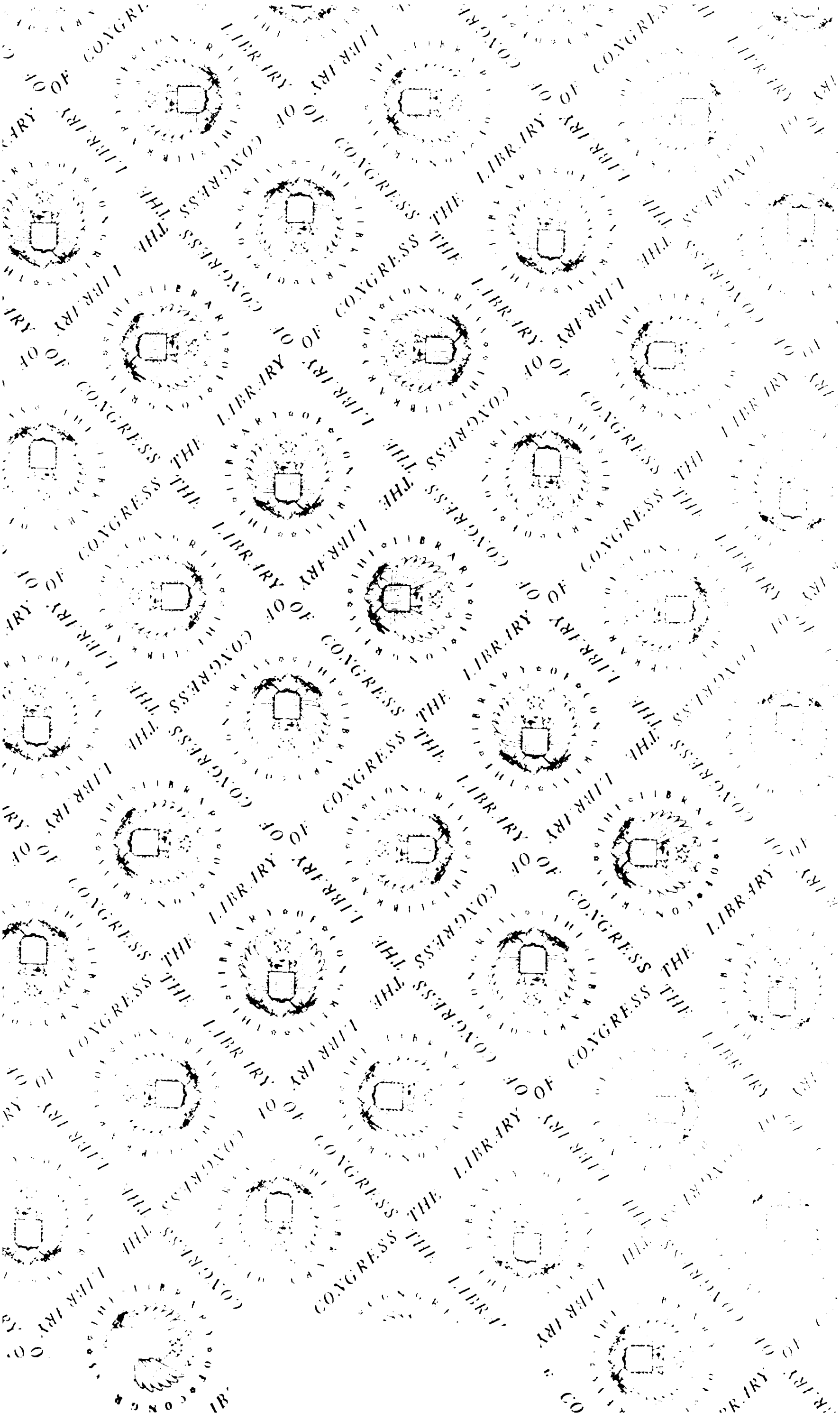

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METEOROLOGY; IMPORTATIONS OF GRAIN; SALES OF BRITISH WHEAT; PRICES OF CORN AND OTHER PRODUCE; AGRICULTURAL STATISTICS; AND STATISTICS OF DAIRY PRODUCE.

[*The facts are derived chiefly from the Meteorological Reports of* Mr. Glaisher, *and the Returns of the* Board of Trade *and of the* Inspector-General of Imports and Exports.]

METEOROLOGY.—1879.

***First Quarter** (January, February, March).*—The readings of the barometer showed an average slight excess in January and March, whereas they ruled considerably below the average in February, indeed it was the wettest February back to 1815, with the exception of 1866: the month was very destructive to vegetation; the mean reading of the quarter was 29·67. The short period of warm weather, which set in on 26th December, ended on 2nd January, when a cold period set in and lasted till 4th February; after 10 days of comparatively warm weather, low temperature prevailed again from 17th February till 3rd March. From 4th to 20th March the temperature was generally above the average; from 21st to 28th it was severely cold, and the last few days of the quarter were warm.

The *mean temperature* of the quarter was 37°·1, and was 2°·8 below the average for the corresponding period in 38 years; the mean showed a deficiency of 6°·8 in January, of 1°·2 in February, and of 0°·4 in March.

The *fall of rain*, at Greenwich, for the quarter was 7·0 inches, and was 2·0 inches above the average amount in the corresponding quarter in 64 years; 2·6 inches fell in January, 3·8 in February, and 0·6 of an inch in March.

The number of hours of bright sunshine measured during the quarter at Greenwich Observatory was 137·5, against 141·0 in the corresponding period of last year. The month of January was unusually sunless, only 14·8 hours of bright sunshine being recorded.

***Second Quarter** (April, May, June).*—The readings of the barometer showed a slight excess during May, but were considerably below the average both in April and June; the mean reading in the quarter was 29·67, and was 0·12 below the average for the corresponding period in 38 years. The weather throughout these three months continued cold, wet, and sunless.

During the quarter the temperatures of 17 days only were of their average or a little above their average values, all the rest were below, and at times very much below; on some days both in April and May the deficiency of temperature was as large as 10°, 11°, or 12°, and towards the end of June several days together were of lower temperature than their averages by 5° or 6°.

The mean deficiency for the 91 days in the quarter was 3°·36 on the average of the preceding 60 years.

The *mean temperature* of the quarter was only 49°·5, the lowest since the very severe corresponding period in 1837, when it was 48°·3, and there have been nine instances only back to 1771 of such low temperatures, viz. in the years 1771, 1773, 1782, 1793, 1799, 1812, 1816, 1824, and 1837.

This unusually protracted bad weather set in on 27th October, 1878; the weather in November and December was exceptionally severe, the mean temperature of these two months being 36°·7, a lower value than any experienced in this century, and back to 1771 the instances of somewhat lower temperatures were 1782, when it was 35°·4; 1784, 35°·8; 1786, 36°·3; 1788, 34°·8; and 1796, 35°·4.

The mean value for January was only 31°·9, being 5¼ nearly below the average of 60 years, and it is very remarkable that these three months should be of such low temperatures, as they have recently been from 2° to 3° of higher temperatures than they were a hundred years ago. The months of February and March were together but slightly below their averages, so that the mean temperature of the quarter ending March 31st, though low, viz. 37°·1, had been of lower value in twenty instances in the preceding 108 years.

With respect to the mean temperature of the eight months ending June 1879, viz. 41°·65, it is the lowest since the celebrated year of great frost, 1814, when it was still lower, viz. 40°·4.

Vegetation, generally, at the end of this quarter was fully a month or six weeks later than usual.

The *rainfall* of the quarter at Greenwich was 10·3 inches, measured on 51 days, and exceeded the average amount in the corresponding quarter of 64 years by 4·5 inches. The rainfall amounted to 2·6 inches in April, 3·4 inches in May, and 4·3 inches in June; the amount exceeded the average in each month, the largest excess occurring in June. Only four times since 1815 has the rainfall of the second quarter of the year exceeded 10 inches. The rainfall of the first six months of this year was no less than 17·3 inches, and was without a single exception greater than in any corresponding six months since 1815.

The number of hours of bright sunshine measured during the quarter at Greenwich Observatory was 352·1, against 486·0 and 499·8 hours respectively, in the second quarters of 1877 and 1878. The deficiency of sunshine was relatively greatest in June.

Third Quarter (*July, August, September*).—The mean readings of the barometer were below the average during each of the months of this quarter, the depression being greatest during July.

The month of July was dull, very cold and sunless, with many days of temperature from 7° to 9° below their averages. Rain fell on every day during the first half of the month, and frequently afterwards, and snow fell at Bolton on both the 4th and 8th, and at Cockermouth on the 9th.

August was a month of very unsettled weather, with very little sunshine; about the middle of the month there were a few days whose mean temperature was equal to or slightly in excess of their averages, and during which period no rain fell, but rain was nearly continuous at all other parts of the month; it was a cold and very wet month, and thunderstorms were frequent.

During the first few days of September no rain fell, and it was fine and dry, but, from the 6th, rain fell nearly daily, and the remainder of the month was cloudy and gloomy.

Till July 27th the average deficiency of mean temperature was 5° daily, and from July 28th to the end of the quarter, notwithstanding the few days of slight excess of temperature, the deficiency of temperature was ¾° daily.

Thus the weather during ths whole quarter has been cold, wet, and sunless, being a continuation of the bad weather which had been prevalent for the eight preceding months.

The month of September was the eleventh month in succession of low temperature, and there are only two instances in this century, viz. in 1813–14, and 1815–16, when the temperatures of these eleven months (November 1878 to September 1879) were closely approximate to that of the present period.

The *mean temperature* of the quarter was 58°·1, and was 1°·6 below the average for the corresponding period in 108 years. It was below the average in each month of the quarter; the deficiency of temperature was equal to 3°·5 in July, 1°·0 in August, and 0°·2 in September.

The *rainfall* of the quarter was remarkable both for its frequency and for the amount measured. At the Royal Observatory, Greenwich, 11·75 inches were measured on 53 of the 92 days of the quarter, exceeding the average in 64 years by 4·4 inches; 3·7 inches were measured in July, 5·2 inches in August, and 2·8 inches in September. The rainfall exceeded the average in each month of the quarter; the excess was largest in August. The previous instances of such a large fall in this quarter are—in the year 1828, 13·8 inches, in the year 1829, 12·3 inches, in the year 1839 and 1867, 11·4 inches, and in 1875, 10·3 inches; in all other years the fall has been less than 10 inches; this by itself would have been remarkable, but is much more so when added to the heavy falls of the preceding six months, viz. 17·3 inches, making the total fall this year to the end of September the unprecedented amount of 29 inches.

The number of hours of bright sunshine measured during the quarter at Greenwich Observatory was 354·9, against 441·4 and 451·4 in the corresponding periods of 1877 and 1878; the most marked deficiency of sunshine occurred during July.

Fourth Quarter (*October*, *November*, *December*).—The readings of the barometer were above their averages in each month of the quarter.

The month of October was perhaps the finest month in the year, yet it was cold, dull, and sunless, with a smaller rainfall than in any October since 1834. November was an exceedingly cold month, with scarcely any rain till after the 18th day; it was not, however, a dry month owing to mists. December was a remarkably cold month, of lower temperature than any December in this century; it was also remarkable for dense and very continuous fogs and high readings of the barometer.

In October the temperature was variable: there were a few days of warm weather, then a few days of cold weather, the latter preponderating, and so on throughout the month. From November 1st to December 27th the weather was most winterly and very severe. The day of lowest temperature was December 7th; its mean temperature was 23°·6, being 17°·9 below its average. The coldest group of days was from December 1st to 7th; their mean temperature was 25°·9, or 15°·8 below their averages. The mean daily temperature of the 12 days between November 30th and December 11th was 27°·85, or 13°·67 below the average for these days. The mean temperature of the 38 days ending December 27th was 31°·1, or 9°·7 below the average.

The temperature of every month of the year was below its average, and there is no other instance back to the year 1771 of such being the case. The mean temperature of the year 1879 was 46°·2, being lower than that of any other year in this century, with the exception of the year 1814, when it was 45°·8; but in this year both May and December were more than 2° above their averages.

The month of December was the fourteenth month in succession of low temperature. The mean for this period was 44°·8, and it is necessary to go back to the years 1813–14 for a corresponding period of a similar low temperature, so that there is no instance in this century of a period of lower temperature than the one we are passing through. In 1815 the cold period of fourteen months was followed by a cold January, but both February and March were warm.

The *mean temperature* for the quarter was 39°·9, being 3°·7 and 4°·6 respectively, below the averages of the preceding 108 years and 38 years. The mean showed a deficiency of 0°·5 in October, 4°·0 in November, and 6°·7 in December, compared with the average for corresponding periods of 108 years. It was the coldest December in this century, and there are but three instances of so cold a December back to 1771, viz. in the year 1784, 31°·0, in 1788, 29°·0, and in 1796, 30°·4.

The *fall of rain* in the months of October, November, and December was 2·3 inches, being 4·9 inches less than the average for this quarter, but, in consequence of the excess of rain in the previous months, the year 1879 will rank as a wet one; the fall in the year was 31·3 inches, being greater in amount than in any year since 1860.

The number of hours of bright sunshine recorded during the quarter at Greenwich Observatory was 138·3, against 184·7 and 157·6 hours, respectively, in the fourth quarters of 1877 and 1878. The largest proportional deficiency of sunshine occurred in October.

THE YEAR.

The meteorological elements of the year 1879 differed considerably from their respective averages, and the weather generally was cold, wet, and sunless. Low temperatures were recorded in every month of the year; the rainfall was in excess of that in the previous year, and also of the average: only 983 hours of bright sunshine were recorded at Greenwich, against 1250 hours in the previous year.

The mean of the barometrical values for the year was almost identical with the average of the preceding 38 years, but the readings were principally below the average during the first nine months of the year, and above the average in the last three months, especially in December.

The mean temperature of the year was 46°·2, which was 3°·3 below the average of the previous 38 years; the mean temperature of the last three months of the year was 4°·6 below the average. The month of December was the coldest in this century; its mean temperature was 6°·7 below the average.

The rainfall in 1878 was heavy, 29·0 inches, but this was exceeded in 1879, when 31·4 inches fell, or 5·0 inches above the average of the preceding 64 years. It rained on 179 days out of the 365. The falls of rain in the second and third quarter of the year were remarkably excessive, and measured respectively 10·3 inches and 11·7 inches, being 4·5 inches and 4·4 inches above the respective average amounts of the previous 64 years. The downfall in August was 5·2 inches, and exceeded the average for the month by 2·8 inches.

The wind swept the earth at the mean velocity of 11·6 miles an hour, which is about a mile an hour above the average of 30 years.

TABLE I.—METEOROLOGICAL OBSERVATIONS RECORDED AT THE ROYAL OBSERVATORY, GREENWICH, IN THE FIRST SIX MONTHS OF THE YEAR 1879.

1879. MONTHS.	Temperature of										Elastic Force of Vapour.		Weight of Vapour in a Cubic Foot of Air.	
	Air.			Evaporation.		Dew Point.		Air—Daily Range.		Water of the Thames.				
	Mean.	Diff. from average of 108 years.	Diff. from average of 38 years.	Mean.	Diff. from average of 38 years.	Mean.	Diff. from average of 38 years.	Mean.	Diff. from average of 38 years.		Mean.	Diff. from average of 38 years.	Mean.	Diff. from average of 38 years.
	°	°	°	°	°	°	°	°	°	°	in.	in.	grs.	grs.
January ..	31·9	−4·7	−6·8	30·4	−6·8	27·0	−8·2	7·1	−2·6	34·9	0·146	−0·056	1·7	−0·7
February ..	38·2	−0·5	−1·2	36·7	−1·0	34·7	−0·4	8·3	−2·9	38·9	0·201	−0·006	2·3	−0·1
March ..	41·2	+0·1	−0·4	38·5	−0·7	35·2	−1·1	14·2	−0·4	43·0	0·205	−0·010	2·4	−0·1
Means ..	37·1	−1·7	−2·8	35·2	−2·8	32·3	−3·2	9·9	−2·0	38·9	0·184	−0·024	2·1	−0·3
	°	°	°	°	°	°	°	°	°	°	in.	in.	grs.	grs.
April	43·2	−2·9	−4·0	40·7	−3·4	37·6	−3·0	16·3	−2·2	46·4	0·225	−0·029	2·6	−0·3
May	48·4	−4·1	−4·3	44·7	−4·2	40·7	−4·5	18·3	−2·1	52·0	0·254	−0·046	2·9	−0·6
June	56·9	−1·3	−2·1	53·8	−0·6	51·0	+0·4	17·4	−3·8	59·6	0·374	+0·004	4·2	+0·1
Means ..	49·5	−2·8	−3·5	46·4	−2·7	43·1	−2·4	17·3	−2·7	52·7	0·284	−0·024	3·2	−0·3

NOTE.—In reading this Table it will be borne in mind that the *minus* sign (−) signifies *below* the average, and that the *plus* sign (+) signifies *above* the average.

TABLE II.—METEOROLOGICAL OBSERVATIONS RECORDED AT THE ROYAL OBSERVATORY, GREENWICH, IN THE LAST SIX MONTHS OF THE YEAR 1879.

1879.	Temperature of										Elastic Force of Vapour.		Weight of Vapour in a Cubic Foot of Air.	
	Air.			Evaporation.		Dew Point.		Air—Daily Range.		Water of the Thames.				
MONTHS.	Mean.	Diff. from average of 108 years.	Diff. from average of 38 years.	Mean.	Diff. from average of 38 years.	Mean.	Diff. from average of 38 years.	Mean.	Diff. from average of 38 years.		Mean.	Diff. from average of 38 years.	Mean.	Diff. from average of 38 years.
	°	°	°	°	°	°	°	°	°	°	in.	in.	grs.	grs.
July	58·1	−3·5	−4·1	55·6	−2·1	53·4	−0·5	15·5	−5·7	60·5	0·409	−0·008	4·6	−0·1
August ..	59·9	−1·0	−1·6	57·4	0·0	55·2	+1·4	16·4	−3·4	62·9	0·436	+0·018	4·9	+0·3
September	56·3	−0·2	−0·8	53·8	−0·1	51·4	+0·4	16·3	−2·2	58·8	0·379	+0·001	4·3	−0·1
Means ..	58·1	−1·6	−2·2	55·6	−0·7	53·3	+0·4	16·1	−3·8	60·7	0·408	+0·004	4·6	0·0
	°	°	°	°	°	°	°	°	°	°	in.	in.	grs.	grs.
October ..	49·1	−0·5	−1·1	47·5	−0·7	45·8	−0·2	12·6	− 2·2	—	0·308	−0·005	3·5	− 0·1
November ..	38·3	−4·0	−5·2	36·5	−4·8	34·2	−5·2	10·2	− 1·4	—	0·197	−0·049	2·3	− 0·5
December ..	32·4	−6·7	−7·6	31·3	−7·2	28·8	−7·9	10·6	+ 1·2	—	0·158	−0·062	1·9	− 0·6
Means ..	39·9	−3·7	−4·6	38·4	−4·2	36·3	−4·4	11·1	− 0·8	—	0·221	−0·039	2·6	− 0·4

TABLE III.—METEOROLOGICAL OBSERVATIONS RECORDED AT THE ROYAL OBSERVATORY, GREENWICH, IN THE FIRST SIX MONTHS OF THE YEAR 1879.

1879. MONTHS.	Degree of Humidity.		Reading of Barometer.		Weight of a Cubic Foot of Air.		Rain.		Daily Horizontal movement of the Air.	Reading of Thermometer on Grass.				
										Number of Nights it was			Lowest Reading at Night.	Highest Reading at Night.
	Mean.	Diff. from average of 38 years.	Mean.	Diff. from average of 38 years.	Mean.	Diff. from average of 38 years.	Amount.	Diff. from average of 64 years.		At or below 30°.	Between 30° and 40°.	Above 40°.		
			in.	in.	grs.	grs.	in.	in.	Miles.				°	°
January ..	80	− 7	29·851	+0·097	563	+10	2·6	+0·7	283	24	7	0	18·7	33·0
February ..	87	+ 2	29·363	−0·438	547	− 6	3·8	+2·3	303	11	14	3	23·0	44·9
March ..	80	− 2	29·809	+0·069	552	+ 2	0·6	−1·0	316	13	17	1	24·9	42·2
							Sum	Sum	Mean	Sum	Sum	Sum	Lowest	Highest
Means ..	82	− 2	29·674	−0·091	554	+ 2	7·0	+2·0	301	48	38	4	18·7	44·9
			in.	in.	grs.	grs.	in.	in.	Miles.				°	°
April ..	81	+ 3	29·520	−0·241	544	+ 1	2·6	+0·9	229	8	20	2	24·0	40·5
May	75	− 1	29·833	+0·052	544	+ 3	3·4	+1·3	260	8	14	9	24·6	45·5
June ..	80	+ 6	29·641	−0·171	531	− 1	4·3	+2·3	277	0	3	27	35·8	56·6
							Sum	Sum	Mean	Sum	Sum	Sum	Lowest	Highest
Means ..	79	+ 3	29·665	−0·120	540	+ 1	10·3	+4·5	255	16	37	38	24·0	56·6

NOTE.—In reading this Table it will be borne in mind that the *plus* sign (+) signifies *above* the average, and that the *minus* sign (−) signifies *below* the average.

TABLE IV.—METEOROLOGICAL OBSERVATIONS RECORDED AT THE ROYAL OBSERVATORY, GREENWICH, IN THE LAST SIX MONTHS OF THE YEAR 1879.

1879. MONTHS.	Degre of Humidity.		Reading of Barometer.		Weight of a Cubic Foot of Air.		Rain.		Daily Horizontal movement of the Air.	Reading of Thermometer on Grass.				
										Number of Nights it was			Lowest Reading at Night.	Highest Reading at Night.
	Mean.	Diff. from average of 38 years.	Mean.	Diff. from average of 38 years.	Mean.	Diff. from average of 38 years.	Amount.	Diff. from average of 64 years.		At or below 30°.	Between 30° and 40°.	Above 40°.		
			in.	in.	grs.	grs.	in.	in.	Miles.				°	°
July	84	+ 9	29·628	−0·177	529	+ 1	3·7	+1·2	314	0	0	31	40·0	58·5
August ..	85	+ 9	29·672	−0·114	528	0	5·2	+2·8	285	0	0	31	41·0	56·2
September	84	+ 4	29·802	−0·003	534	+ 1	2·8	+0·4	221	0	3	27	36·0	57·0
							Sum	Sum	Mean	Sum	Sum	Sum	Lowest	Highest
Means ..	84	+ 7	29·701	−0·098	530	+ 1	11·7	+4·4	273	0	3	89	36·0	58·5
			in.	in.	grs.	grs.	in.	in.	Miles.				°	°
October ..	89	+ 3	29·952	+0·253	545	+ 6	0·8	−2·0	253	3	12	16	29·2	50·0
November	85	− 3	30·034	+0·295	559	+11	0·9	−1·5	239	18	11	1	16·0	42·2
December	87	− 1	30·139	+0·353	568	+16	0·6	−1·4	230	24	7	0	13·7	37·5
							Sum	Sum	Mean	Sum	Sum	Sum	Lowest	Highest
Means ..	87	0	30·042	+0·300	557	+11	2·3	−4·9	241	45	30	17	13·7	50·0

NOTE.—In reading this Table it will be borne in mind that the *plus* sign (+) signifies *above* the average, and that the *minus* sign (−) signifies *below* the average.

CORN: IMPORTATIONS, SALES, AND PRICES.

TABLE V.—QUANTITIES of WHEAT, WHEATMEAL and FLOUR, BARLEY, OATS, PEAS and BEANS, IMPORTED into the UNITED KINGDOM in the YEAR 1879.

1879.	Wheat.	Wheatmeal and Flour.	Barley.	Oats.	Peas.	Beans.
	cwts.	cwts.	cwts.	cwts.	cwts.	cwts.
January ..	3,766,238	784,937	644,914	1,027,738	101,200	57,502
February	2,867,994	657,606	345,366	166,573	23,505	64,701
March ..	3,499,374	835,895	669,549	549,906	91,146	84,464
April ..	4,390,704	1,091,779	977,181	683,248	148,057	114,659
May ..	3,618,787	756,234	745,484	1,239,822	169,647	279,694
June ..	4,523,064	836,655	467,118	1,275,072	218,358	297,771
In first Six Months	22,666,161	4,963,106	3,849,612	4,942,359	751,913	898,791
July.. ..	4,988,488	809,009	396,730	1,455,319	76,634	164,350
August ..	6,950,644	794,115	454,788	1,277,796	104,966	207,008
September	6,469,904	987,153	1,165,888	1,483,762	27,806	243,361
October ..	5,979,525	1,040,782	2,173,617	1,489,549	149,420	200,268
November	6,918,362	1,087,584	2,161,208	1,861,931	499,309	296,844
December	5,395,056	1,048,809	1,339,255	971,891	306,729	299,479
In last Six Months	36,701,979	5,767,452	7,691,486	8,540,248	1,164,864	1,411,310
Year ..	59,368,140	10,730,558	11,541,098	13,482,607	1,916,777	2,310,101

NOTE.—The average weights *per quarter* of corn, as adopted in the office of the Inspector-General of Imports and Exports, are as follow:—For wheat, 485⅓ lbs., or 4⅓ cwts.; for barley, 400 lbs., or $3\frac{4}{7}$ cwts.; for oats, 308 lbs., or 2¾ cwts. Corn has been entered by *weight* instead of *measure* since September, 1864. No duty has been charged since 1st June, 1869.

TABLE VI.—COMPUTED REAL VALUE of CORN IMPORTED into the UNITED KINGDOM in each of the FIVE YEARS, 1875-79.

	1875.	1876.	1877.	1878.	1879.
	£.	£.	£.	£.	£.
Wheat	27,418,970	23,140,766	33,820,084	27,397,487	31,329,500
Barley	4,630,654	3,745,420	5,396,791	5,545,802	4,798,923
Oats	5,407,928	4,619,427	4,998,864	4,553,946	4,500,760
Maize	8,112,158	12,744,432	9,851,236	12,589,422	9,802,249
Other kinds	2,304,218	2,555,397	2,321,922	1,463,433	1,634,064
Wheat Flour	4,828,167	4,729,206	6,803,327	6,790,320	8,505,308
Other kinds of Flour	12,130	15,474	17,284	32,214	25,585
Total of Corn ..	52,714,225	51,550,122	63,209,508	58,372,624	60,596,389

TABLE VII.—QUANTITIES of BRITISH WHEAT SOLD in the Towns from which Returns are received under the Act of the 27th & 28th VICTORIA, cap. 87, and their AVERAGE PRICES, in each of the TWELVE MONTHS of the YEARS 1874–79.

	QUANTITIES IN QUARTERS.					
	1874.	1875.	1876.	1877.	1878.	1879.
	quarters.	quarters.	quarters.	quarters.	quarters.	quarters.
First month ..	187,106	210,661	154,367	152,557	146,848	183,223
Second month	189,031	223,974	188,539	173,729	164,387	237,861
Third month (five weeks)	206,145	292,172	208,367	213,718	174,025	234,469
Fourth month	150,725	233,970	160,868	150,012	146,933	197,918
Fifth month ..	175,715	234,683	174,153	132,231	166,909	227,295
Sixth month (five weeks)	172,298	216,016	188,611	122,390	137,981	229,307
Seventh month	95,871	121,684	90,626	77,674	82,597	105,139
Eighth month	82,564	135,456	88,030	89,759	119,611	71,525
Ninth month (five weeks)	323,153	199,314	314,327	225,659	272,699	75,374
Tenth month	248,984	226,503	216,393	217,046	329,564	96,261
Eleventh month	225,162	186,607	192,440	175,262	216,187	156,218
Twelfth month (five weeks)	335,339	234,035	225,254	212,627	276,943	207,511

	AVERAGE PRICES PER QUARTER.											
	1874.		1875.		1876.		1877.		1878.		1879.	
	s.	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*
First month ..	62	4	44	4	44	11	51	7	51	11	39	3
Second month	63	4	42	3	43	4	51	8	51	5	38	0
Third month (five weeks)	61	1	41	2	43	1	51	1	49	8	39	7
Fourth month	60	0	43	0	44	11	53	4	51	3	41	0
Fifth month ..	62	2	42	5	45	0	65	10	51	11	40	10
Sixth month (five weeks)	61	2	42	2	47	0	64	6	48	0	41	8
Seventh month	60	8	45	3	48	6	62	9	44	11	44	6
Eighth month	58	4	52	4	46	4	64	11	44	7	49	4
Ninth month (five weeks)	48	11	49	3	46	8	59	1	44	1	47	7
Tenth month ..	44	8	46	1	46	7	53	7	39	7	48	10
Eleventh month	43	11	47	4	48	0	52	3	40	1	49	4
Twelfth month (five weeks)	44	6	46	4	49	9	51	6	40	8	46	7

Table VIII.—Average Prices of British Corn per Quarter (Imperial measure) as received from the Inspectors and Officers of Excise according to the Act of 27th & 28th Victoria, cap. 87, in each of the Fifty-two Weeks of the Year 1879.

Week ending	Wheat.		Barley.		Oats.		Week ending	Wheat.		Barley.		Oats.	
	s.	d.	s.	d.	s.	d.		s.	d.	s.	d.	s.	d.
January 4..	39	7	38	10	20	3	July 5..	42	4	24	6	24	2
January 11..	39	7	36	11	20	1	July 12..	43	4	24	0	21	0
January 18..	38	11	36	11	19	8	July 19..	44	10	28	0	22	0
January 25..	39	1	37	5	20	1	July 26..	47	7	29	1	24	4
February 1..	38	4	36	9	19	5	August 2..	49	3	28	6	21	8
February 8..	38	1	35	7	20	0	August 9..	49	7	26	11	24	2
February 15..	38	1	35	5	19	2	August 16..	49	5	31	0	23	6
February 22..	37	7	34	10	20	3	August 23..	49	3	31	1	24	10
March 1..	38	0	33	10	19	7	August 30..	48	1	29	7	24	9
March 8..	39	1	34	4	20	5	September 6	48	2	32	11	26	7
March 15..	39	7	34	1	20	9	September 13	47	11	36	8	25	7
March 22..	40	8	33	9	21	1	September 20	47	4	43	2	22	11
March 29..	40	8	33	0	20	8	September 27	46	5	41	11	23	11
Average of Winter Quarter	39	0	35	6	20	1	Average of Summer Quarter	47	2	31	4	23	9
April 5..	40	11	32	6	21	1	October 4..	47	1	40	7	23	4
April 12..	41	0	32	3	20	8	October 11..	48	8	40	9	22	2
April 19..	41	2	30	11	20	7	October 18..	49	9	40	10	22	2
April 26..	40	11	31	0	20	11	October 25..	49	10	40	10	22	3
May 3..	40	9	30	1	21	9	November 1	50	4	41	1	22	1
May 10..	40	9	30	9	21	5	November 8	50	5	40	8	21	6
May 17..	40	8	30	1	21	11	November 15	48	9	40	1	21	4
May 24..	41	4	28	10	22	6	November 22	47	10	39	8	21	6
May 31..	41	5	28	6	21	11	November 29	46	7	38	10	20	6
June 7..	41	7	26	6	21	8	December 6	46	7	38	4	21	4
June 14..	41	4	28	2	22	3	December 13	46	2	38	5	21	4
June 21..	41	8	25	11	23	5	December 20	46	6	38	7	20	11
June 28..	42	6	28	1	22	1	December 27	47	1	37	11	20	10
Average of Spring Quarter	41	2	29	6	21	8	Average of Autumn Quarter	48	1	39	8	21	7

TABLE IX.—QUANTITIES of WHEAT, BARLEY, OATS, PEAS, BEANS, INDIAN CORN or MAIZE, WHEATMEAL and FLOUR, IMPORTED in the FOUR YEARS 1876–79; also the COUNTRIES from which the WHEAT, WHEATMEAL, and FLOUR were obtained.

	1876.	1877.	1878.	1879.
Wheat from—	cwts.	cwts.	cwts.	cwts.
Russia	8,769,260	10,838,000	9,032,930	7,975,144
Denmark	262,518	73,812	*	*
Germany	2,324,148	5,455,763	5,118,135	3,616,419
France	293,350	1,494,783	11,200	17,793
Turkey and Roumania	1,238,851	1,253,018	240,105	170,354
Egypt	2,218,227	2,447,709	217,498	2,064,397
United States	19,299,785	21,308,667	28,963,901	35,976,805
Chili	982,619	736,011	50,573	1,372,461
British India	3,279,887	6,104,940	1,819,304	887,256
Australia	*	425,697	1,459,850	2,245,657
British North America ..	2,417,151	2,912,178	2,603,586	4,676,686
Other countries	3,308,356	1,186,122	294,561	365,168
Total Wheat ..	44,394,152	54,162,888	49,811,643	59,368,140
Barley	9,770,075	12,970,751	14,162,028	11,541,098
Oats	11,204,588	12,925,604	12,765,789	13,482,607
Peas	1,609,997	1,511,846	1,804,733	1,916,777
Beans	4,601,206	4,573,482	1,870,508	2,310,101
Indian Corn, or Maize	39,958,226	30,455,681	41,631,348	36,078,586
Wheatmeal and Flour from—				
Germany	930,469	1,239,437	1,118,761	914,483
France	1,083,447	1,900,213	696,059	355,229
United States..	2,320,886	1,771,558	3,635,200	6,863,172
British North America	282,053	254,695	294,448	460,435
Other countries	1,325,685	2,203,626	2,079,531	2,137,239
Total Wheatmeal and Flour	5,942,540	7,369,529	7,823,999	10,730,558
Indian Corn Meal	7,706	9,713	41,679	37,080

* Included under "Other Countries.'

-AVERAGE PRICES of Consols, of Wheat, of Meat, and of Potatoes; also the AVERAGE
ER of PAUPERS relieved on the *last day* of each Week; and the MEAN TEMPERATURE,
h of the Sixteen Quarters ending December 31st, 1879.

AVERAGE PRICES.						PAUPERISM.		
Consols (for Money).	Minimum Rate per Cent. of Discount charged by the Bank of England.	Wheat per Quarter in England and Wales.	Meat per lb. at the Metropolitan Meat Market (by the Carcass).		Potatoes (York Regents) per Ton, at Waterside Market, Southwark.	Quarterly Average of the Number of Paupers relieved on the *last day* of each week.		Mean Temperature.
			Beef.	Mutton.		In-door.	Out-door.	
£.		*s.* *d.*						°
$95\frac{7}{8}$	2·00	51 4	$4\frac{4}{8}$*d.*—$7\frac{6}{8}$*d.* Mean $6\frac{1}{8}$*d.*	5*d.*—$9\frac{3}{8}$*d.* Mean $7\frac{1}{8}$*d.*	138*s.*—172*s.* Mean 155*s.*	152,778	532,697	42·3
$94\frac{7}{8}$	2·96	61 5	$4\frac{4}{8}$*d.*—$8\frac{2}{8}$*d.* Mean $6\frac{3}{8}$*d.*	$4\frac{6}{8}$*d.*—$9\frac{2}{8}$*d.* Mean 7*d.*	136*s.*—174*s.* Mean 155*s.*	143,674	523,878	51·9
$95\frac{1}{8}$	2·45	62 0	$4\frac{4}{8}$*d.*—$8\frac{2}{8}$*d.* Mean $6\frac{4}{8}$*d.*	$4\frac{6}{8}$*d.*—$9\frac{3}{8}$*d.* Mean $7\frac{4}{8}$*d.*	97*s.*—126*s.* Mean 111*s.*6*d.*	139,211	509,110	58·5
$96\frac{3}{8}$	4·50	52 4	$3\frac{6}{8}$*d.*—8*d.* Mean $5\frac{7}{8}$*d.*	$4\frac{2}{8}$*d.*—$8\frac{6}{8}$*d.* Mean $6\frac{4}{8}$*d.*	152*s.*—174*s.* Mean 163*s.*	151,709	512,286	45·0
$95\frac{3}{8}$	2·48	50 10	$4\frac{1}{8}$*d.*—$8\frac{1}{8}$*d.* Mean $6\frac{1}{8}$*d.*	$4\frac{5}{8}$*d.*—$9\frac{2}{8}$*d.* Mean 7*d.*	188*s.*—212*s.* Mean 200*s.*	162,442	540,571	41·5
$95\frac{5}{8}$	2·85	50 2	$4\frac{4}{8}$*d.*—$8\frac{5}{8}$*d.* Mean $6\frac{5}{8}$*d.*	5*d.*—$9\frac{4}{8}$*d.* Mean $7\frac{2}{8}$*d.*	150*s.*—187*s.* Mean 168*s.*6*d.*	151,715	533,787	54·6
$95\frac{1}{8}$	4·36	44 6	$4\frac{4}{8}$*d.*—$8\frac{2}{8}$*d.* Mean $6\frac{3}{8}$*d.*	$4\frac{6}{8}$*d.*—$9\frac{2}{8}$*d.* Mean—7*d.*	120*s.*—151*s.* Mean 135*s.*6*d.*	145,956	513,616	60·8
95	5·4	40 2	$4\frac{2}{8}$*d.*—$7\frac{6}{8}$*d.* Mean 6*d.*	$4\frac{7}{8}$*d.*—$8\frac{6}{8}$*d.* Mean $6\frac{7}{8}$*d.*	111*s.*—132*s.* Mean 121*s.*6*d.*	159,721	523,996	41·6
$96\frac{3}{8}$	3·38	39 0	$3\frac{7}{8}$*d.*—$7\frac{2}{8}$*d.* Mean $5\frac{5}{8}$*d.*	$4\frac{4}{8}$*d.*—$8\frac{4}{8}$*d.* Mean $6\frac{4}{8}$*d.*	118*s.*—144*s.* Mean 131*s.*	172,200	599,991	37·1
$98\frac{4}{8}$	2·05	41 2	$4\frac{1}{8}$*d.*—$7\frac{2}{8}$*d.* Mean $5\frac{6}{8}$*d.*	$4\frac{6}{8}$*d.*—9*d.* Mean $6\frac{7}{8}$*d.*	128*s.*—161*s.* Mean 144*s.*6*d.*	159,946	567,915	49·5
$97\frac{6}{8}$	2·00	47 2	4*d.*—$7\frac{6}{8}$*d.* Mean $5\frac{7}{8}$*d.*	$4\frac{5}{8}$*d.*—9*d.* Mean $6\frac{7}{8}$*d.*	182*s.*—233*s.* Mean 207*s.*6*d.*	157,113	548,755	58·1
98	2·60	48 1	$3\frac{6}{8}$*d.*—$7\frac{2}{8}$*d.* Mean $5\frac{4}{8}$*d.*	$4\frac{4}{8}$*d.*—$7\frac{7}{8}$*d.* Mean $6\frac{2}{8}$*d.*	136*s.*—160*s.* Mean 148*s.*	173,099	565,644	39·9

TABLE XI.—ACREAGE under each Description (

GREAT BRIT

DESCRIPTION of CROPS and LIVE STOCK.	GREAT BRITAIN.§		
	1877.	1878.	
CORN CROPS:—	Acres.	Acres.	
Wheat	3,168,540	3,218,417	2,
Barley or Bere	2,417,588	2,469,652	2,
Oats	2,754,179	2,698,907	2,
Rye	60,146	60,117	
Beans	497,879	437,936	
Peas	311,797	282,617	
TOTAL CORN CROPS	9,210,129	9,167,646	8,
GREEN CROPS:—			
Potatoes	512,471	508,431	
Turnips and Swedes	2,073,455	2,031,860	2,
Mangold and Beetroot	358,055	343,389	
Carrots and Parsnips	15,953	14,711	
Cabbage, Kohl-rabi, and Rape	182,710	171,773	
Vetches, Lucerne, and any other crop (except clover or grass)	442,202	420,846	
TOTAL GREEN CROPS	3,584,846	3,491,010	3,
OTHER CROPS, GRASS, &c.:—			
Flax	7,481	7,261	
Hops	71,239	71,789	
Bare fallow or uncropped arable land	616,147	632,423	
Clover and artificial and other grasses under rotation	4,494,216	4,573,107	4,
Permanent pasture, meadow, or grass not broken up in rotation (exclusive of heath or mountain land)	13,728,355	13,911,296	14,
LIVE STOCK:—	No.	No.	
Cattle	5,697,933	5,738,128	5,
Sheep	28,161,164	28,406,206	28,
Pigs	2,498,728	2,483,248	2,
Total number of horses used for agriculture, unbroken horses, and mares kept solely for breeding	1,388,582	1,412,502	1,
Acreage of orchard, or of arable or grass-land, used also for fruit-trees	163,290	165,415	
Acreage of woods, coppices, and plantations	2,187,078*	2,187,078*	2,

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* As

Fallow, and Grass, and Number of Cattle, Sheep, and Pigs, in Ireland, in 1877–79.

Ireland.			United Kingdom, including the Islands.		
1877.	1878.	1879.	1877.	1878.	1879.
Acres.	Acres.	Acres.	Acres.	Acres.	Acres.
143,319	154,011	157,508	3,321,065	3,381,701	3,056,428
226,603	244,504	254,845	2,652,300	2,722,879	2,931,809
1,471,698	1,412,637	1,330,212	4,238,957	4,124,029	3,998,200
10,441	10,864	9,086	70,703	71,074	58,288
8,584	8,267	9,294	506,701	446,466	453,751
1,202	1,138	855	313,470	284,026	278,983
1,861,847	1,831,421	1,761,800	11,103,196	11,030,175	10,777,459
871,522	846,985	842,621	1,392,784	1,364,508	1,392,822
336,201	329,942	314,666	2,419,296	2,372,198	2,341,527
48,753	45,187	51,163	407,518	389,306	415,450
3,503	3,938	4,530	19,943	19,163	20,913
47,006	46,938	40,326	229,786	218,855	208,808
47,868	44,770	41,330	492,364	468,165	492,036
1,354,853	1,317,760	1,294,636	4,961,691	4,832,195	4,871,556
123,362	111,808	128,004	130,846	119,076	135,060
..	..	..	71,239	71,789	67,671
16,678	16,971	16,295	633,495	650,238	738,264
1,925 168	1,942,716	1,937,348	6,460,404	6,557,748	6,450,905
10,145,227	10,124,745	10,198,139	23,903,314	24,065,394	24,395,905
No.	No.	No.	No.	No.	No.
3,996,027	3,984,751	4,067,094	9,731,537	9,761,288	9,961,536
3,989,178	4,094,230	4,017,889	32,220,067	32,571,018	32,237,958
1,467,999	1,269,340	1,071,990	3,984,447	3,767,960	3,178,106
496,165	504,750	513,036	1,894,128	1,927,066	1,955,394
..	..	..	..	..	..
328,413	..	..	..	..	..

in 1872.

TABLE XII.—NUMBER of BEASTS exhibited and the PRICES realised for them at the CHRISTMAS MARKETS since 1843.

Year.	Beasts.	Prices.	Year.	Beasts.	Prices.
		s. d. s. d.			s. d. s. d.
1843	4,510	4 0—4 4	1862	8,430	3 4—5 0
1844	5,713	4 0—4 6	1863	10,372	3 6—5 2
1845	5,326	3 6—4 8	1864	7,130	3 8—5 8
1846	4,570	4 0—5 8	1865	7,530	3 4—5 4
1847	4,282	3 4—4 8	1866	7,340	3 8—5 6
1848	5,942	3 4—4 8	1867	8,110	3 4—5 0
1849	5,765	3 4—4 0	1868	5,320	3 4—5 8
1850	6,341	3 0—3 10	1869	6,728	3 6—6 2
1851	6,103	2 8—4 2	1870	6,425	3 6—6 2
1852	6,271	2 8—4 0	1871	6,320	3 10—6 2
1853	7,037	3 2—4 10	1872	7,560	4 6—6 0
1854	6,181	3 6—5 4	1873	6,170	4 4—6 6
1855	7,000	3 8—4 2	1874	6,570	4 4—6 8
1856	6,748	3 4—5 0	1875	7,660	4 6—6 6
1857	6,856	3 4—4 8	1876	7,020	4 4—6 4
1858	6,424	3 4—5 0	1877	7,510	4 6—6 0
1859	7,560	3 6—5 4	1878	6,830	4 6—6 0
1860	7,860	3 4—5 6	1879	5,620	4 0—6 4
1861	8,840	3 4—5 0			

TABLE XIII.—AVERAGE PRICES of BRITISH WHEAT, BARLEY, and OATS, per IMPERIAL QUARTER, in each of the SIXTEEN YEARS 1863–79.

Year.	Wheat.	Barley.	Oats.	Year.	Wheat.	Barley.	Oats.
	s. d.	s. d.	s. d.		s. d.	s. d.	s. d.
1863	44 9	33 11	21 2	1872	57 0	37 4	23 2
1864	40 2	29 11	20 1	1873	58 8	40 5	25 5
1865	41 10	29 9	21 10	1874	55 9	44 11	28 10
1866	49 11	37 5	24 7	1875	45 2	38 5	28 8
1867	64 6	40 0	26 1	1876	46 2	35 2	26 3
1868	63 9	43 0	28 1	1877	56 9	39 8	25 11
1869	48 2	39 5	26 0	1878	46 5	40 2	24 4
1870	46 10	34 7	22 10	1879	43 10	34 0	21 9
1871	56 10	36 2	25 2				

Table XIV.—Certain Articles of Foreign and Colonial Production Imported in Years 1876–79; and their Quantities.

	1876.	1877.	1878.	1879.
Animals, Living:				
Oxen, Bulls, and Cows, number	227,478	174,023	226,455	208,7
Calves .. .. ,,	44,098	30,172	27,008	39,1
Sheep .. .. ,, Lambs .. .. ,,	1,041,494	874,062	892,126	944,8
Swine and Hogs .. .. ,,	43,558	20,037	55,911	52,2
Bones (burnt or not, or as animal charcoal) .. .. tons	85,135	104,223	85,773	65,0
Cotton, Raw .. .. .. cwts.	13,346,739	12,112,819	11,978,288	13,171,0
Flax .. .. ,,	1,404,661	2,216,267	1,553,664	1,694,0
Guano .. .. ,,	210,918	152,990	178,178	76,9
Hemp .. .. ,,	1,170,728	1,251,458	1,224,195	1,204,0
Hops .. .. ,,	167,421	248,620	169,512	262,6
Hides untanned: Dry .. ,,	469,460	551,547	565,909	545,3
„ „ Wet .. ,,	583,914	594,542	595,221	463,0
Petroleum .. .. tuns	100,175	134,096	119,169	170,8
Oilseed Cakes .. .. .. tons	190,225	163,349	201,299	216,0
Potatoes .. .. cwts.	6,031,341	7,969,136	8,751,174	9,352,2
Butter .. .. ,,	1,659,357	1,637,939	1,795,413	2,045,6
Cheese .. .. ,,	1,538,475	1,651,088	1,965,949	1,789,1
Eggs .. .. .. great hundreds	6,274,924	6,257,892	6,529,036	6,388,8
Lard .. .. cwts.	558,983	592,944	908,187	838,8
Bacon .. .. ,,	2,809,990	2,395,223	3,466,565	3,996,9
Hams .. .. ,,	349,455	423,869	797,336	906,1
Salt Beef .. .. ,,	243,342	208,364	219,445	242,8
Salt Pork .. .. ,,	350,151	295,524	369,500	400,5
Clover Seeds .. .. ,,	387,099	358,056	305,049	345,2
Flax-seed and Linseed .. qrs.	1,998,130	1,706,796	1,990,529	1,665,3
Rape .. .. ,,	499,218	539,263	641,261	365,3
Sheep and Lambs' Wool .. lbs.	385,987,842	405,949,161	395,461,286	411,106,6

Table XV.—Quantity and Value of Meat Imported in the 6 Years, 1874–

QUANTITIES.

	1874.	1875.	1876.	1877.	1878.	1879.
	Cwts.	Cwts.	Cwts.	Cwts.	Cwts.	Cwts.
Beef, Salted or Fresh ..	261,721	215,581	413,351	678,505	723,558	806,4
Meat, „ „ ..	119,401	144,954	92,556	130,178	145,493	151,5
Total	381,124	360,535	505,907	808,683	869,051	957,9
Meat, Preserved otherwise than by salting	265,223	171,373	283,066	469,003	438,903	566,7
Total Meat ..	646,347	531,908	788,973	1,277,686	1,307,954	1,524,7

VALUES.

	1874.	1875.	1876.	1877.	1878.	1879.
	£.	£.	£.	£.	£.	£.
Beef, Salted or Fresh ..	523,326	454,337	943,580	1,686,392	1,753,066	1,919,9
Meat, „ „ ..	335,846	419,019	281,830	388,933	426,864	436,3
Total	859,172	873,356	1,225,410	2,075,325	2,179,930	2,356,2
Meat, preserved otherwise than by salting	757,001	592,196	887,035	1,434,234	1,313,541	1,688,3
Total Meat ..	1,616,173	1,465,552	2,112,445	3,509,559	3,493,471	4,044,5

The quantity of meat imported in 1878 was 1,307,954 cwts., against 1,277,686 in the previous year; in 1879 the quantity was 1,524,725 cwts., being an increase over that of the previous year of 216,771 cwts.

The average price of beef per lb. by the carcass at the Metropolitan Meat Market was 5⅝*d.* in 1879; in 1878 it was 6⅜*d.*, showing a reduction in 1879 of 10 per cent. The average price of mutton per lb. was 6⅝*d.* in 1879; in 1878 it was 7*d.*, showing a reduction in 1879 of 5 per cent.

The reduction in the price of beef and mutton since 1876 was equal to 15 and 12 per cent. respectively; it appears therefore that the increased importation of meat has had the effect of reducing the price of butchers' meat at the wholesale market.

In 1879 there was a decrease, compared with the previous year, in the number of oxen, bulls, and cows of 17,735, and in swine and hogs of 3,644; but there was an increase in the number of sheep and calves of 52,743 and 12,164 respectively.

STATISTICS OF DAIRY PRODUCE.

The following remarks relating to Butter and Cheese are extracted from 'The Grocer':—

The provision trade in the year 1879 was marked by some almost unprecedented characteristics. Prices of cheese and butter, during some months, were lower than were ever previously known, whilst in others they have reached quite a maximum point. During July and August, American cheese of the best grades sold as low as 32*s.* and 33*s.*, whilst low and secondary descriptions were all but given away at prices ranging as low as from 13*s.* to 15*s.* In November and December best descriptions realised 72*s.* per cwt. English Cheddars sold at the earlier period as low as 30*s.* and 32*s.*; the same grades at the end of the year brought 75*s.* and 76*s.*, whilst extra prime qualities sold at 86*s.* and 88*s.* The same as to butters. In the early summer months values ruled lower than had ever been known. The make was small, but the necessities of the Irish dairy farmers compelled them to throw their stocks upon the market, and the result was great cheapness. The shortness of the make, however, soon afterwards began to tell its tale. Values moved rapidly upward, and in December they were as high as they have generally been at the close of the season in February.

Butter.—The year 1879 commenced with severe weather, and scarcely a week passed up to the end of March without falls of snow in some parts of the United Kingdom; the summer was wet, and the harvest was bad; all this told disastrously in the various departments of agriculture, and produced such variations in the prices of butter as have not been known for many years. The months of January, February, March, and April passed without quotations for Clonmel or Carlow butter, and this continued until about the third week in May, when a few small sales were made of fine Clonmels at 98*s.* to 100*s.* f.o.b.; good useful brands were offered at shillings less. These prices continued until the middle of July, when quotations were lowered at the end to 80*s.* to 90*s.*; then very little change took place until the third week in August, when they were offered for shipment, and sales made, at 80*s.* to 84*s.* f.o.b. At these prices a few buyers were found, and shippers refused to sell to a further extent. A few sales were made early in September at 85*s.* to 94*s.* f.o.b. A sudden reaction then took place; in the second week 100*s.* to 110*s.* were the prices asked, a further advance of 10*s.* the next week, and at the close of the month the quoted rates for fine were 110*s.* to 124*s.* The first week in October, 112*s.* to 126*s.*, varying according to freshness and repute of brand, and at the close of the month, 124*s.* to 136*s.* These prices nearly stopped the demand; but shippers, believing fine butter would be scarce before the close of the season, were not anxious sellers. Throughout the month of November the demand was very limited, quotations nearly nominal at the same prices as in October—124*s.* to 136*s.* f.o.b. In the first week in December, with a continuation of severe weather for three or four weeks, holders of the best brands advanced their asking prices 2*s.*, say to 126*s.* to 138*s.*, but buyers did not respond. Second and third weeks unchanged.

Cork Butter.—In this market the severity of the weather had its influence also upon the labour in the agricultural districts, and strikes in the mining and manufacturing districts left the labouring classes with less money to spend upon necessaries of life. The first week in January began with prices for firsts, 125*s.* to 133*s.*; at the end of the month they were 112*s.* to 133*s.*, and so continued to the first week in March; the second week they were 2*s.* higher. These were the last-quoted prices for firsts for the season. In the beginning of January seconds were 112*s.* to 120*s.*; thirds, 78*s.* to 80*s.*; seconds then, for the remainder of the month, varied from 115*s.* to 125*s.*; thirds, 80*s.* to 83*s.* Seconds the first week in February were 110*s.* to 127*s.*; at the end of the month, 110*s.* to 130*s.*

In the middle of March they were 105*s.* to 133*s.*; at the end of the month, 102*s.* to 125*s.* In the first and second weeks of April they were 90*s.* to 107*s.*, according to freshness. This finished the season's classification for old. At the close of the month of January, thirds were 83*s.* The first week in February they were 90*s.* to 96*s.*; at the end of the month, 94*s.* to 99*s.* In the beginning of March they were 90*s.* to 95*s.*; then gradually declined to 76*s.* to 82*s.* at the close. The first fortnight in April they varied from 70*s.* to 75*s.* This closed the season for the brands of 1878. The closing prices in the Cork market were 102*s.* for seconds and 78*s.* for thirds. The new season's brands for 1879 opened on April 14 in the Cork market at 104*s.* for seconds and 70*s.* for thirds. Here they were quoted the third week in April 95*s.* to 115*s.* for seconds; at the end of the month, 101*s.*; thirds, 84*s.* In the third week in May firsts were 98*s.*, the last week 93*s.*, and remained the same to the second week in June; the next week, 90*s.*, the last week, 87*s.* Seconds the first week in May, 93*s.*, the third week a gradual decline to 89*s.*, the last week, 82*s.* Thirds the first week, 78*s.*, then 80*s.* to 81*s.* to the third week, and the last week 76*s.* Seconds the first week in June, 81*s.*, and, with a gradual decline, were at 76*s.* the end of the month; thirds, in a like manner, began at 77*s.*, and finished at 70*s.* July, firsts began at 86*s.*, and finished at 83*s.*; seconds began and finished at 75*s.*; and thirds, 67*s.* to 69*s.* August, firsts commenced at 84*s.* to 85*s.*; were 82*s.* to 83*s.* the third week, and 89*s.* the last; seconds, the first week, 75*s.* to 76*s.*; the third week, 72*s.*; the last week, 78*s.*; thirds, the first week, 70*s.*, the third week, 65*s.*; the end of the month, 69*s.* Buyers now began to think that prices had for a length of time been unnaturally low, and a sudden reaction took place. At the beginning of September firsts were 95*s.*; the second week, 110*s.* to 113*s.*, the next week, 2*s.* more; the end of the month, 110*s.* to 126*s.* October, first week same price; the last, 125*s.* to 130*s.* November began with firsts at 125*s.* to 130*s.*, and gradually increased to 130*s.* to 140*s.* at the close. Seconds, the first week in September, 88*s.*; the second week, 96*s.* to 100*s.*; the last week, 95*s.* to 113*s.* To the second week in October they had advanced only 1*s.*; at the end of the month they were 114*s.* to 118*s.* The first week in November they were 116*s.* to 122*s.*, the last week 115*s.* to 120*s.* In September thirds were, the first week, 74*s.*; the second week, 85*s.* to 87*s.*; the last week, 90*s.* to 100*s.* In October, the first week, 84*s.* to 92*s.*; the next week, 90*s.* to 103*s.*; the last week, 105*s.* to 110*s.* In November prices fluctuated considerably; the first week they were 104*s.* to 112*s.*, the second week, 112*s.* to 117*s.*; the last week, 107*s.* to 109*s.* In the beginning of December, first Corks were advanced to 136*s.* to 143*s.*, seconds were 115*s.* to 126*s.*, and thirds, 108*s.* to 112*s.* Very few firkins were then classed as firsts in the Cork market. The second week firsts were 140*s.* to 145*s.*; seconds, 115*s.* to 121*s.*; thirds, 108*s.* to 110*s.* The third week scarcely any firsts were offered; seconds, 116*s.* to 126*s.*; thirds, fresh inspected, 106*s.* to 109*s.*

Foreign Butter.—Really fine butters were scarce. First Normandys began at 130*s.* to 136*s.*, and finished at 128*s.* to 136*s.*; but from the first week in January to the third week in February prices varied little. Dutch began at 116*s.* to 120*s.*; the third week in January they were 120*s.* to 124*s.*; the first two weeks in February, 134*s.* to 136*s.*; the next week, 130*s.* to 132*s.* In American there was a wide range, the extremes, according to quality, were 50*s.* to 110*s.*; the next fortnight, 40*s.* to 110*s.*; then, to the third week in February, 35*s.* to 120*s.* The month of April began with cold weather, and vegetation was backward. In the first week of May there was snow and frost, and the end of the month was wet; this kept vegetation backward. Normandy firsts, in the first week in April, were 104*s.* to 120*s.*; in the first week in May they were 112*s.* to 130*s.* American, at the same period, was 30*s.* to 105*s.* The month of June was milder, but much rain fell, and vegetation was still very backward; at the end of the month there was scarcely any signs of haymaking. July also was wet and cold, and the rainfall was heavy; harvest prospects were therefore gloomy. From the beginning of June to the end of August first Normandys fluctuated but little. The haymaking season was the worst one known in England for many years; the crops were light, potatoes were blighted, fruit was not half an average crop, and hops not one-fourth. In September the prices of first Normandys differed little from those of the previous month; they began at 106*s.* to 112*s.*, and closed at 108*s.* to 118*s.* In October prices began to advance, and early in November they were 122*s.* to 128*s.*; then, with a change to severe winterly weather, at the end of this month the prices were 126*s.* to 132*s.* In December there was a falling off in the make of fine butter, and prices in the third week were 136*s.* to 146*s.* for those in casks. Dutch butter was 108*s.* to 112*s.* in the first week in September; the third week in December it was 130*s.* to 140*s.* In American there was a wide range both in quality and price; the first week in September the prices were 60*s.* to 95*s.*; the third week in December they were 90*s.* to 140*s.*

Cheese.—For the first six months of the year there was scarcely any change worth notice in the prices of the best descriptions of

English cheese; some of the lower qualities were affected by the prices at which American cheese were offered. From the beginning of January to the middle of February the quoted rates for Cheshire were 62*s.* to 82*s.*; then 62*s.* to 83*s.*, to the middle of April; then 56*s.* to 83*s.* to the end of June. Quotations for Cheddar varied from 44*s.* to 84*s.*, according to qualities, from the first week in January to the last week in February; then 44*s.* to 85*s.* to the end of May, and 44*s.* to 80*s.* to the end of June. Really fine English was scarce and firmly held from the lateness of the season; very little of this summer's make has yet been brought to market. Holders of lower qualities were anxious sellers. The first fortnight in July Cheddars were 44*s.* to 80*s.*; 44*s.* to 76*s.*, the third week; the last week, 44*s.* to 64*s.* A few of this season's make then came forward. From the first to the third week in August prices were 44*s.* to 76*s.*; then, to the end of the month, 60*s.* to 73*s.* The low prices at which Americans were now offered materially lessened the demand for English. For Cheshire cheese the prices in the first fortnight in July were quoted at 50*s.* to 82*s.*; the next week, 50*s.* to 76*s.*; the end of the month, 45*s.* to 76*s.* The first fortnight in August, 45*s.* to 68*s.*; then 40*s.* to 70*s.*, to the first week in September; then 66*s.* to 74*s.*; in the middle of the month, 64*s.* to 76*s.*; and at the end of the month and to the end of October, 64*s.* to 82*s.* A sudden reaction now took place in the price of American. For the first three weeks in November prices of Cheshires were 62*s.* to 86*s.*; then, to the end of December, 62*s.* to 88*s.* The first week in September, Cheddar cheese was quoted at 64*s.* to 78*s.*; the second week, 62*s.* to 76*s.*; the third week, 64*s.* to 76*s.*; then, 62*s.* to 80*s.* from the last week in September to the end of October; from the first week to the third week in November, 72*s.* to 84*s.*; then, 72*s.* to 86*s.*, to the end of December.

AMERICAN CHEESE.—The prices fluctuated very much. Best, the first week in January, 46*s.* to 53*s.*; lower qualities, 23*s.* to 40*s.*: best from the second week to the end of the month, 51*s.* to 53*s.*; lower qualities, 22*s.* to 48*s.*: best, first fortnight in February, 50*s.* to 53*s.*; then 52*s.* to 54*s.* to the middle of March; lower qualities, the middle of February, 22*s.* to 48*s.*; the end of the month, 26*s.* to 48*s.*, March, 24*s.* to 48*s.*: best, from the first week in April to the first week in June, 50*s.* to 52*s.*; lower qualities, the beginning of April to third week, 25*s.* to 48*s.*; then 24*s.* to 46*s.* to the middle of May; then 22*s.* to 46*s.* to the first week in June. New, from the second week in June to the end of the month, 40*s.* to 42*s.*; lower qualities, the first week in June, 22*s.* to 46*s.*; second week, 26*s.* to 46*s.*; last

The following Quotations, &c., are extracted from ' The Grocer.'

TABLE XVI.—AVERAGE and CURRENT PRICES of BUTTER and CHEESE on 1st SATURDAY in JANUARY of each YEAR, from the latest actual MARKET SALES.

	Average Annual Price in the 5 years, 1870-74.	Average Annual Price in the 5 years, 1875-79.	Current Price, 1st January, 1880.
	Per cwt.	Per cwt.	Per cwt.
Butter:	s. s.	s. s.	s. s.
Carlow, finest, F.O.B	126 to 136	131 to 144	126 to 140
,, Landed ..	124 ,, 138	138 ,, 148	
Cork, 1sts..	138 ,, 143	143 ,, 148	145 ,, ..
,, 2nds	129 ,, 135	133 ,, 137	143 ,, ..
,, 3rds, new ..	111 ,, 116	108 ,, 109	115 ,, ..
,, 4ths	98 ,, 98	90 ,, 91	96 ,, ..
Limerick..	117 ,, 122	124 ,, 129	
Foreign:			
Friesland..	113 ,, 130	132 ,, 137	128 ,, 134
Jersey, &c.	79 ,, 129	94 ,, 134	125 ,, 136
Kiel	111 ,, 145	135 ,, 164	.. ..
Normandy	93 ,, 150	92 ,, 151	120 ,, 146
American	82 ,, 115	81 ,, 121	90 ,, 135
Bosch	.. ..	.. ..	65 ,, 95
Cheese:			
English Cheddar, fine, new	76 ,, 90	72 ,, 90	72 ,, 86
,, good, new	74 ,, 93	.. ..	.. ..
Red Somerset Loaf..	68 ,, 81	77 ,, 87	74 ,, ..
White or yellow Cheddar Loaf ..	72 ,, 81	78 ,, 87	.. ..
Scotch Cheddar ..	67 ,, 77	164 ,, 189	.. ..
Cheshire, new.. ..	76 ,, 87	78 ,, 86	64 ,, 86
,, good ditto	58 ,, 70	53 ,, 71	.. ..
Wiltshire, new ..	67 ,, 78	70 ,, 79	62 ,, 76
,, good ditto	57 ,, 64	60 ,, 68	.. ..
North Wilts Loaf, new	66 ,, 80	72 ,, 81	.. ..
Derby ,, ,,	65 ,, 83	74 ,, 64	70 ,, 74
Foreign:			
American, fine ..	68 ,, 73	63 ,, 67	64 ,, 68
,, good ..	54 ,, 65	41 ,, 59	56 ,, 60
Gouda	49 ,, 64	52 ,, 61	56 ,, 62
Edam, new	53 ,, 68	56 ,, 65	56 ,, 64
Gruyère, new	.. ..	76 ,, 85	71 ,, 78

TABLE XVII.—QUANTITY and VALUE of BUTTER IMPORTED from DENMARK, 1865-78.

Years.	Quantities.	Computed Real Value.	Years.	Quantities.	Computed Real Value.
	Cwts.	£.		Cwts.	£.
1865	65,555	362,440	1872	173,574	1,009,322
1866	67,305	319,528	1873	201,558	1,203,459
1867	80,589	422,479	1874	226,053	1,363,433
1868	79,437	471,262	1875	206,171	1,275,870
1869	103,613	574,981	1876	205,195	1,311,234
1870	127,013	767,190	1877	210,322	1,347,791
1871	140,851	803,226	1878	242,427	1,517,467

TABLE XVIII. — QUANTITY and VALUE of BUTTER Imported from the UNITED STATES, BELGIUM, FRANCE and HOLLAND; and of CHEESE Imported from the UNITED STATES and HOLLAND, 1865–78.

Years.	UNITED STATES.			
	Butter.		Cheese.	
	Quantities.	Computed Real Value.	Quantities.	Computed Real Value.
	Cwts.	£.	Cwts.	£.
1865 ..	83,216	437,703	442,913	1,296,204
1866 ..	16,059	77,754	415,726	1,386,447
1867 ..	39,035	113,290	526,740	1,470,017
1868 ..	7,117	37,279	489,117	1,439,380
1869 ..	17,203	84,603	487,870	1,612,325
1870 ..	16,915	80,928	555,385	1,861,263
1871 ..	83,775	394,359	731,326	2,014,805
1872 ..	45,765	199,679	598,198	1,701,435
1873 ..	43,406	199,639	790,238	2,353,181
1874 ..	36,307	188,769	849,933	2,589,776
1875 ..	40,331	205,900	958,978	2,786,027
1876 ..	118,131	593,122	936,203	2,564,977
1877 ..	188,491	920,561	1,082,844	3,129,829
1878 ..	219,794	998,766	1,345,745	3,306,612

Years.	BELGIUM.		FRANCE.	
	Butter.		Butter.	
	Cwts.	£.	Cwts.	£.
1865 ..	70,619	433,179	353,115	1,867,085
1866 ..	76,667	426,712	452,196	2,276,493
1867 ..	80,754	470,464	450,693	2,265,147
1868 ..	70,456	405,987	393,578	2,156,824
1869 ..	85,789	481,609	407,432	2,231,450
1870 ..	84,408	516,643	289,692	1,672,899
1871 ..	94,539	523,460	304,683	1,636,006
1872 ..	74,191	409,555	355,089	1,916,795
1873 ..	76,610	439,501	446,550	2,409,861
1874 ..	76,723	465,517	713,251	3,944,233
1875 ..	79,950	499,028	567,560	3,387,219
1876 ..	65,309	419,209	622,488	3,732,405
1877 ..	58,200	378,435	606,762	3,654,488
1878 ..	80,073	499,889	555,272	3,179,326

Years.	HOLLAND.			
	Butter.		Cheese.	
	Cwts.	£.	Cwts.	£.
1865 ..	345,026	1,886,486	386,962	1,100,037
1866 ..	383,225	1,979,070	426,559	1,317,231
1867 ..	326,217	1,733,459	332,628	961,245
1868 ..	343,322	1,992,414	329,565	959,547
1869 ..	415,176	2,253,420	426,913	1,262,101
1870 ..	406,795	2,388,459	422,553	1,204,830
1871 ..	390,616	1,986,708	348,148	954,236
1872 ..	269,091	1,358,579	329,535	942,537
1873 ..	279,004	1,453,875	336,654	1,013,233
1874 ..	351,605	1,877,755	398,888	1,164,921
1875 ..	357,106	1,917,910	370,123	1,078,594
1876 ..	402,984	2,252,909	330,435	949,413
1877 ..	372,134	2,084,686	341,980	984,855
1878 ..	460,601	2,494,903	355,159	1,018,669

JOURNAL
OF THE
ROYAL AGRICULTURAL SOCIETY OF ENGLAND.

I.—*Report of the Judges appointed by the Royal Agricultural Society of England to adjudicate the Prizes in the Sewage Farm Competition*, 1879.

Two prizes, each of the value of one hundred pounds, were offered for the best-managed Sewage Farms in England and Wales, by the Mansion House Committee in connection with the London International Exhibition of the Society, and these prizes were accepted by the Council. One prize was offered in Class I. for the best-managed sewage farm utilising the sewage of not more than twenty thousand people, and another prize was offered in Class II. for the best-managed sewage farm utilising the sewage of more than twenty thousand people.

In Class I. the following sewage farms were entered:—

Aldershot, by J. T. Blackburn.
Bedford, by the Corporation of Bedford.
Guisbrough, by Admiral Thomas Chaloner.
Wrexham, by Lieut.-Col. Alfred S. Jones, V.C.

In Class II. the following sewage farms were entered:—

Birmingham, by the Birmingham, Tame, and Rea District Drainage Board.
Croydon, by Joseph Parrott.
Doncaster, by R. S. Brundell.
Reading, by the Corporation of Reading.
Leamington, by the Earl of Warwick.

In considering the reports on the several sewage farms which are appended, it must not be overlooked that the season of 1878-9 has probably been the most disastrous which has been known in the annals of British agriculture for a very long period, it having been one of the wettest, coldest, and latest seasons on record. The excess of moisture and the absence of sunshine, which have been so unfavourable to all agricultural

operations, have told with even greater force upon sewage fa
which necessarily at all times have to dispose of a large q
tity of water, in addition to the ordinary rain falling on
land. If, therefore, in the following reports, remarks of a
paraging nature are made, not only should the difficulti
keeping an ordinary farm clean during the last season be b
in mind, but also that the difficulties are much greater in
case of sewage farms, where hoeing, instead of destroying,
only transplanted the weeds. Moreover, the expenses c
sewage farm during such a season as that of 1879 have
considerably greater than usual in consequence of the difficu
experienced in attempting to harvest hay and corn throu
protracted period; while the difficulty of disposing of g
produce was increased, owing to the general abundance of
and other green crops, and at the same time sewage-gr
produce was much depreciated in value. The annexed t
will show some of the chief monetary features of the se
farms which have been examined, from which it will be
that the profit or loss on a sewage farm is almost ent
dependent upon the amount of rent, rates, and taxes which
paid. The conclusions to be drawn from our investigations
us to state that practically there appears to be no great valu
sewage itself, but that, given an ordinary farm and a se
farm at the same rent, the sewage farm will hold its
even in a wet and backward year like the past, but in
periods the sewage farm has a much greater advantage ove
ordinary farm. As a mode of effectually disposing of se
in an innocuous manner, and generally in an economical
an examination of the several farms and of their accounts sl
that the system pursued is most successful and satisfactory.
advantage and economy of sewage-farming, as a mode of dea
with sewage, are shown very conclusively in the case of
mingham, in which the farming operations show a prof
1064*l.* 18*s.* 7*d.* in the year 1878, while the chemical treat
of the sewage, two-thirds of which is passed into the str
of the district after such treatment, cost in the same
11,987*l.* 15*s.* 3*d.*

It will be observed from the annexed table that thei
a very considerable difference both in the amount of ca
engaged upon the several farms, and in the gross returns per
In cases where market gardening is in vogue, as at Bedford,
mingham, Wrexham, and, to a small extent, at Croydon
gross returns per acre are the largest. The amount of w
paid per acre on these farms is also the greatest. The
returns per acre for Leamington appear small, but this is d
its being saddled with a large acreage of grass-land, whic

878-1879.

Loss per Acre.	Population contributing to Sewage.	Number of People contributing to an Acre calculated on whole Area of Farm.	Number of People contributing to an Acre calculated on Area actually Irrigated.	REMARKS.
£ s. d.				
..	8,000	77	81	Information not available.
1 6 7¼	18,690	102	122	Includes cost of pumping sewage.
..	112,500	444	539	No rent charged for freehold land.
14 5 1¾	55,000	121	172	
0 17 4½	21,000	69	92	Does not include cost of pumping.
..	5,300	219	330	
..	23,000	30	142	Rent includes amount paid for sewage, but does not include cost of pumping.
1 17 11	33,000	51	433	Does not include cost of pumping or rent.
..	10,000	96	99	

but when men are employed the weekly wage is 18*s.*
the loss 6*l.* 7*s.* 3¾*d.* per acre.

To face page 2.

itself would not give any great return per acre. When, however, the gross returns per head of the population contributing to the sewers are considered, then Leamington comes out in a more favourable light; but here again the large acreage absolutely increases this amount beyond its true value. It should be remarked that a large area of ordinary agricultural land attached to a sewage farm does not always add to the profit of the undertaking. This will be clearly seen from an examination of the accounts of the Reading Sewage Farm, which has a larger proportion of unirrigated to irrigated land than any other farm which we examined; and yet the undertaking has always been carried on at a loss if a reasonable amount of rent is charged for the land. At Croydon, it is shown that in the year ending 25th March, 1879, there was a loss of 14*l*. 5*s*. 1¾*d*. per acre, the gross returns per acre having only reached 10*l*. 1*s*. 11*d*. per acre as against 17*l*. 12*s*. 11½*d*. per acre in the previous year, and as against a loss of 6*l*. 7*s*. 3¾*d*. per acre in that year, which was the largest amount lost in any year up to that period on this farm.

There is also a very considerable difference in regard to the physical properties of the soil on the several farms. This is very distinctly shown by experiments which have been made upon the absorbing properties of the soils collected from the different farms which are given in the table on page 4.

It should be borne in mind, in considering this table, that the less absorbent the soil is, the more readily will it act as a filter. This is clearly shown by the results when we take a case like Doncaster (No. 13), where there is no surface-effluent, and very little subsoil-effluent flowing from the land. It is confirmed again by the light sandy soils of Leamington (No. 18), and also by the fact that samples Nos. 11 and 12 from Croydon are taken from a field which is noted for disposing of large volumes of sewage. The subsoil of this field possesses great filtration powers, but little capacity for absorption.

We are happy to report that in every case we received from the several competitors all the assistance and information which were necessary in forming our judgment of the merits of each farm.

In adjudicating the order of merit of the several farms, we took into consideration the instructions given to us, viz.:—

1. General management with a view to profit.
2. Productiveness of crops.
3. Goodness and suitability of stock (where there were any).
4. Management of grass-land.
5. State of carriers, gates, fences, roads, and general neatness.
6. Mode of book-keeping followed.

STATEMENT of the PHYSICAL PROPERTIES of the SOILS on the several SEWAGE-FARMS.

No.	Name of Place.	Description of Soil.	Percentage of Water by Weight. Soil will absorb.
1	Aldershot	Light sandy	36·2
2	Bedford	Light sandy	34·7
3	Bedford	Loamy soil	43·5
4	Birmingham	Light soil, containing peat and other organic matter	79·7
5	Birmingham	Stiff land, clay soil	57·6
6	Croydon (Beddington)	Light peaty soil	103·0
7	Croydon (Beddington)	Subsoil below last sample, yellow marl	25·9
8	Croydon (Beddington)	Gravelly surface soil	48·5
9	Croydon (Beddington)	Gravelly surface soil	49·7
10	Croydon (Beddington)	Subsoil, open gravel from below last sample	13·1
11	Croydon (Beddington)	Gravelly soil (dark colour), containing organic matter and fine roots	65·9
12	Croydon (Beddington)	Open gravel subsoil from under last sample	9·4
13	Doncaster	Light sandy soil	24·2
14	Doncaster	Soil from mangold field	28·8
15	Doncaster	Stiff soil (clay)	47·3
16	Guisbrough	Stiff soil	54·3
17	Guisbrough	Stiff soil	49·3
18	Leamington	Light sandy soil	23·4
19	Leamington	Stiff soil	44·9
20	Leamington	Heavy soil (clay)	56·6
21	Reading	Light soil	40·2
22	Reading	Subsoil, one foot deep below last sample	32·7
23	Reading	Stiff soil	43·3
24	Reading	Subsoil one foot deep below last sample	46·2
25	Wrexham	Sandy and peaty, containing much organic matter (Stanstey Meadow)	61·5
26	Wrexham	Sandy and peaty, containing much organic matter (from market garden)	80·0

In judging the large farms we had not much trouble in determining the order of merit, but in the small farms there was much greater difficulty, owing to the differences of soil, climate, and other conflicting details.

In Class I., for farms utilising the sewage of not more than 20,000 people, we say that the Sewage Farm of the Corporation of Bedford, managed by Mr. J. H. Collett, and that of Wrexham, farmed by Lieut.-Colonel Alfred S. Jones, V.C., are in our judgment equal in merit, and we adjudicate the prize to them jointly.

In Class II., for farms utilising the sewage of more than 20,000 people, we adjudicate the prize to the Earl of Warwick for the Leamington Sewage Farm, managed, under the direction of Captain Fosbery, the Earl of Warwick's agent, by Mr. Tough, the bailiff. We are, however, strongly of opinion that a second prize should be given in this class, which, if given, we award to Mr. R. S. Brundell, in connection with the Sewage Farm of Doncaster, which is an admirable example of thrifty management, and shows how sewage can be applied to general farming. We also highly commend the Sewage Farm of the Birmingham, Tame, and Rea District Drainage Board, managed by Mr. James Anscombe.

We should add that the Prize Farm, and the second farm in Class II., possess a much higher order of merit than the Prize Farms in Class I. We consider that it would be an invidious position for the Sewage Farm at Doncaster to be placed in not to receive a prize, having regard to the fact that its merits considerably exceed those of the Prize Farms in Class I.; therefore we recommend the Council of the Royal Agricultural Society to take this matter into their consideration, with a view to giving a second prize in Class II.*

Name of Farm.	Number of Years in Operation.	Persons employed or living on Farm.	Children living on Farm.	Number of Deaths occurring.
Aldershot	15	25	12	0
Bedford	11	28	6	0
Birmingham	12	28	9	2‡
Croydon	18	94	30	5§
Doncaster	6	44	22	0
Guisbrough	9	8	4	0
Leamington	8	46	14	2
Reading	4	88†	32	1
Wrexham	10	19	8	0
Totals	93	380	137	10

With respect to the sanitary aspect of sewage-farming, the above table will show the several particulars which have been collected in reference to the farms during the period they have been in operation, the number of persons either living or working on the farms, the number of children residing on the farms, and the number of deaths which have occurred. An examination of this table will show that the rate of mortality on an average of the number of years which these farms have been in operation does not exceed three per thousand per annum. This is a very low rate, but in all probability it may not be lower than would be found in an equal number of selected lives taken from an agricultural district. The results of the sanitary inquiry show that sewage-farming is not detrimental to life or health.

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* The Council decided, at their meeting in February, to give a Special Prize of 25*l.* to Mr. R. S. Brundell in connection with the Doncaster Sewage Farm.

† These figures do not include the men engaged in laying out additional land for sewage purposes.

‡ These deaths occurred in connection with sewage tanks and not sewage farm.

§ These deaths have occurred within the last ten years.

A statement made by the manager of the Croydon Sewage Farm that the horses on that farm were very subject to grease, caused us to make special inquiry into this subject, and we found that on no other sewage farm were the horses subject to this particular disease, or to any other disease; but that both horses and other live stock were very healthy on all the farms we examined.

Sewage-farming is becoming an important agricultural feature in the country, there being at the present time about one hundred such farms in operation. The following detailed reports relating to the management of the various sewage farms entered in competition will, we trust, be of some value to all interested in sewage operations.

BALDWIN LATHAM.
CLARE SEWELL READ.
THOS. H. THURSFIELD.

CLASS I.—BEDFORD SEWAGE FARM.

THIS farm is held under five separate owners, to whom the following rents are paid by the Corporation of Bedford:—

OWNERS.	Acreages.			Rent Paid.		
	A.	R.	P.	£	s.	d.
Duke of Bedford	43	2	11	196	0	0
Captain Polhill Turner, M.P. ..	80	0	0	426	0	0
Rev. J. G. C. Campion	20	1	27	130	0	0
Corporation of Bedford	27	2	34	124	0	0
Hospital of St. John	11	1	30	51	10	0
	183	0	22	927	10	0
Add paid to London and North-Western Railway Company for Sewer crossing under Railway				1	0	0
				£928	10	0

The farm was established in 1868, and is managed for the Corporation of Bedford by Mr. J. H. Collett, and it receives the sewage of the borough of Bedford, which contains a population of 18,690 persons. Of the 183 a. 0 r. 22 p., 153 a. 1 r. 2 p. are arable, and 29 a. 3 r. 20 p. pasture; and 153 acres of the farm are irrigated with sewage. The soil of the farm is light land, the subsoil being gravel. Experiments have been made with two samples of the soil, which show, on an average of three experiments with the most sandy soil, that it is capable of absorbing 33·6 per cent. of its weight in water, and that the more loamy soil would absorb 42·3 per cent. of its weight in water. As a rule, the smaller the percentage of water absorbed the greater is the percolating power of the water through the soil.

The sum of 6950*l.* has been expended upon this farm and upon the works necessary for lifting the sewage upon it, the expenditure being divided as follows:—

	£	*s.*	*d.*	£	*s.*	*d.*
Cost of land on which pumping works are placed	..	..	..	250	0	0
Engine and boiler-house	779	15	2			
Pump, engines, &c.	969	17	3			
Cast-iron delivery main	748	4	4			
Miscellaneous	352	18	10			
				2850	15	7
Compensation				53	1	0
Farm buildings				603	11	8
Labour, laying out farm, making roads, &c.	1213	9	1			
Horse hire for ditto	331	3	9			
Pipes, bricks, &c., used on farm	1647	19	7			
				3192	12	5
				£6950	0	8

The sewage from Bedford is brought by gravitation to the site of the pumping station, which is situated upon land contiguous to the farm and adjoining the river Ouse, into which there is a storm-water overflow. When the river is in flood, we were informed that the sewers were liable to be flooded from the leakage into the outfall-sewer; and at such times the sewage, with the exception of such portions of the solids as are retained by a grating, is turned directly into the river, as we found on our second visit to this farm, when the whole of it was passing into the river. At the pumping station there are a pair of horizontal high-pressure engines working centrifugal pumps, which are employed to lift the sewage on to the farm. The following figures show the acreage and the height to which the sewage is lifted:—

A.	R.	P.	
30	0	21	—Sewage requires to be lifted 21 feet.
123	0	1	— „ „ 13 „
30	0	0	—Not irrigated.

At the sewage pumping station there is a tank with an iron screen across it, which intercepts some of the solid matter from the sewage, and a man is engaged to keep this screen free. The matter removed from the sewage, which is a comparatively small quantity, is either used upon the contiguous garden or upon the farm. The pumping is usually only carried on in the daytime. At night the sewage is stored in the sewers, and the average daily quantity pumped is 950,000 gallons. The quantity of coal used daily to raise the sewage averages 21 cwt. The sewage having been screened, it is pumped through an 18-inch iron delivery main, having a 15-inch iron branch delivery main, to one part of the farm; from thence it is distributed in earthenware pipe-carriers laid in embankments above the surface of the land, which vary in size from 18 inches to 9 inches in diameter. The distribution of the sewage over the land irrigated is through earth-cut channels, which are ploughed or dug out from time to time as required. A small portion only of the farm, about 5 acres in extent, has been under-drained with 2-inch pipe-drains 60 feet apart and 3 feet deep. Very little effluent was flowing through these drains at the time of our inspection, but the whole of the fields of the sewage farm are surrounded by deep ditches, which tend very materially to drain the subsoil. We were informed that if the circumstances had admitted of a greater depth being given to the land drains, they would have been placed lower, but the falls in this case would not admit of the drains being laid deeper.

A great variety of crops are grown upon this sewage farm, which is treated as a combined sewage farm and market-garden. It is somewhat singular that the peculiar crop, whatever it may be, that suits the neighbourhood, seems to flourish under sewage. Lucerne is not a plant which we would select as the most likely to be benefited by sewage, yet in Paris it is almost the only green crop grown on the sewaged land, it being the favourite provender of the district. So onions, that are grown in great profusion around Bedford, seem to flourish upon sewaged land and appear the most profitable crop to grow. The following table (page 9), which was handed to us by the farm manager, shows the acreage and the value of the produce for the four years 1875 to 1878; and an examination of the accounts for 1878 showed that the income and expenditure had been as in the table on page 10.

BEDFORD SEWAGE FARM.

Statement of Cropping with Acreage and Average Price per Acre of each Crop for the Years 1875–6–7 and 1878.

Description of Crop.	1875.			1876.			1877.			1878.		
	Acreage.	Average per Acre.	Total Produce.	Acreage.	Average per Acre.	Total Produce.	Acreage.	Average per Acre.	Total Produce.	Acreage.	Average. per Acre.	Total Produce.
	A. R. P.	£ s. d.	£ s. d.	A. R. P.	£ s. d.	£ s. d.	A. R. P.	£ s. d.	£ s. d.	A. R. P.	£ s. d.	£ s. d.
Italian Rye-grass	22 0 0	18 2 9	399 0 6	30 0 0	12 8 1	372 2 6	31 0 0	10 6 9¼	320 10 0	24 0 0	7 13 4	184 0 0
Permanent Pasture	30 0 0	6 1 0¼	181 10 6	30 0 0	7 8 3¾	222 9 2	7 2 0	8 0 0	60 0 0	7 2 0	6 7 7¼	47 17 0
Mangolds	40 2 20	14 15 0½	599 6 6	38 0 20	14 0 8¼	535 1 3	37 0 0	12 16 11	475 6 0	35 2 0	13 13 4¾	485 5 5
Swedes	..	..	..	..	..	..	2 1 30	12 17 9	31 8 1½	2 2 0	13 17 7	34 14 0
Carrots	7 3 0	15 1 5	116 1 0	16 0 0	10 4 9¼	163 16 4	7 2 0	17 0 0	127 10 0	8 2 0	15 5 7	129 17 5
Parsnips	..	..	..	..	..	..	1 0 20	17 15 6	20 0 0	1 3 0	20 0 0	35 0 0
Potatoes	25 1 0	5 11 6½	140 16 6	10 0 0	11 2 2	111 1 6	15 2 0	13 5 2	205 10 0	9 1 0	16 16 9½	155 15 4
Onions	10 0 20	28 6 10¾	287 0 0	11 0 10	32 8 5¾	358 13 9	13 3 0	29 3 7½	401 5 0	16 2 20	33 5 7¾	553 6 3
Wheat	16 1 10	14 0 4½	228 13 9	10 1 0	6 11 3¾	67 6 1	13 0 0	14 11 9¼	189 13 1½	18 0 0	10 19 1	197 3 6
Oats	14 0 0	8 3 11	114 15 0	12 0 0	9 14 9	116 17 0	11 2 0	12 5 0	140 17 6	17 0 0	12 9 7¾	212 4 0
Beans	..	..	..	4 3 0	13 1 0½	62 0 0	3 2 0	6 0 0	21 0 0	3 3 10	13 2 3	50 0 0
Spring Cabbage	6 1 10	13 17 7	87 12 0	6 0 0	13 8 10	80 13 0	3 0 0	14 0 0	42 0 0	3 0 0	11 8 6	34 5 6
Pickling Cabbage	1 1 0	27 18 11	34 18 8	2 2 0	10 0 11¼	25 2 4	2 0 0	8 12 8½	17 5 5¼	..	..	..
Savoys	..	..	..	3 0 0	14 13 11	44 1 9	2 1 0	16 0 0	36 0 0	3 2 20	14 0 6½	50 17 0
Cauliflowers	6 0 0	1 13 4	10 0 0	2 0 0	18 6 6	36 13 0	1 2 0	21 7 4	32 1 0	3 1 20	30 4 5	101 19 11
Kidney Beans	..	..	..	0 3 0	16 0 0	12 0 0	1 0 0	20 0 7½	20 0 7½	0 1 0	24 19 4	6 4 10
Celery	..	..	..	0 3 0	53 4 4	38 8 3	0 1 0	48 0 0	12 0 0	0 1 20	36 0 0	13 10 0
Cucumbers	1 0 0	16 1 0	16 1 0	0 3 0	18 13 4	14 0 0	1 0 0	22 15 0	22 15 0	0 2 0	13 7 0	6 13 6
Vegetable Marrows	0 0 10	21 0 0	1 6 3	0 1 0	16 4 0	4 1 0	0 1 0	12 0 0	3 0 0	..	..	..
Rhubarb	0 0 20	40 0 0	5 0 0	0 0 20	32 0 0	4 0 0	0 0 20	12 0 0	1 10 0	0 0 20	11 10 0	1 8 9
Asparagus	0 0 20	20 8 0	2 11 0	0 0 20	36 0 0	4 10 0	0 0 20	48 0 0	6 0 0	0 0 20	56 0 0	7 0 0
Prickly Comfrey	..	..	..	..	..	..	..	..	..	0 1 0	10 0 0	2 10 0
Currant Trees, &c.	..	..	..	2 0 0	5 0 0	10 0 0	0 2 0	6 0 0	3 0 0	0 2 0	..	..
Meadow (sub-let)	..	..	..	..	..	..	22 2 0	..	119 0 0	22 2 0	..	119 0 0
New Asparagus and seed beds	..	..	..	..	..	..	1 3 0	..	..	1 1 0	..	..
	180 3 30	..	2224 12 8	180 1 30	..	2232 16 11	180 0 10	..	2307 11 10	180 1 10	..	2428 12 5

BEDFORD SEWAGE FARM.

STATEMENT of ACCOUNTS for the YEAR ending 31st DECEMBER, 1878.

INCOME.	£	s.	d.	EXPENDITURE.	£	s.	d.
Valuation of Stock and Plant, 31st December, 1878	1375	2	0	Valuation of Stock and Plant, 1st January, 1878 ..	1237	1	0
Sales of Crops	1884	18	10	Wages	573	15	7
Horse Corn, Rye-grass, and Hay consumed	165	0	0	Manager's Salary	145	0	0
Permanent Works	13	7	10	Horse Corn, Keep, and Straw purchased	9	14	7
Income Tax repaid	13	2	9	Horse Corn, Rye-grass, and Hay consumed	165	0	0
Land Tax repaid	4	3	11	Seeds and Plants	144	11	9
Rent of Meadow land	119	17	0	Permanent Works	13	7	10
				Auctioneer's Commission and Expenses	73	18	0
				Rent	928	10	0
				Rates and Taxes	84	6	4
				Insurance	2	0	0
				Miscellaneous Bills	104	12	4
Balance: loss on working	243	15	11	Cost of Pumping Sewage	337	10	10

It will be seen from the foregoing statement of account that if the cost of pumping the sewage is deducted, which is fairly not an item of farm expenditure, the farm shows a profit. At least half the farm is very poor land, which is hired at a stiff price, three times what it is worth to an ordinary farmer. The Corporation, however, have the advantage of farming a portion of the land under the Duke of Bedford, and therefore came in for an abatement of half a year's rent during the past year (1879); and, moreover, the land subject to this abatement in rent is some of the very best on the whole sewage farm.

The cropping of the farm for the past year (1879) was as follows:—

	A.	R.	P.		A.	R.	P.
Potatoes	12	0	0	Brought forward ..	129	3	20
Rye-grass	20	0	0	Winter beans..	3	0	0
Rhubarb..	0	0	20	Kidney beans	1	1	0
Cauliflowers	6	0	0	Swedes	0	3	0
Prickly comfrey	0	1	0	Cabbage (spring)	4	2	0
Barley	4	1	0	Lettuce	0	0	20
Onions	20	1	0	Asparagus	0	1	20
Parsnips..	3	1	0	Currant trees, &c... ..	2	0	0
Carrots	6	1	0	Meadow (let)..	22	2	0
Wheat	16	0	0	Pasture in hand	7	2	0
Mangolds..	26	0	0	Savoys (cabbage)	5	0	0
Oats	15	2	0	Roads, carriers, &c. ..	6	1	2
Carried forward ..	129	3	20	Total acreage of farm..	183	0	22

Rye-grass.—The rye-grass on this farm is allowed to stand for two years. It is sown in the autumn or in spring, as circumstances require. Experience, however, at Bedford shows that this crop has deteriorated in value, so that last year they did not realise more than 7*l.* 13*s.* 4*d.* per acre for it. This falling off in value is principally due to the fact that there has been such an abundance of grass during the last two years that there has been no great demand for the rye-grass. The green crops yield nothing like the sum they ought to produce. This is due, in a measure, to the fact that the Corporation have to sell the produce in a district which is at all times well provided with green food. The chief drawback to this farm appears to be the absence of live stock, but we understand that the Corporation, since our last inspection, have erected a complete set of farm buildings to accommodate twenty-four milking cows, with open sheds for young stock and piggeries; also a residence for the farm manager; and they may reasonably expect that a well-managed dairy-farm, so conveniently situated for the sale of milk, will pay fairly well.

Potatoes.—Potatoes are planted on the flat, 18 inches to 30 inches from row to row, and the distance of the tubers in the rows varying from 15 inches to 18 inches apart, depending upon the variety of potato grown. Early Ashleaf and Magnum Bonum are the kinds most liked. The potatoes are full of top. A dressing of stable-dung is applied to the land. The potato crop is not irrigated with sewage during the period of growth. The farm manager reported, November 7th, 1879, that the Magnum Bonum potatoes are entirely free from disease, and that they have just finished digging over 30 tons of splendid stuff, the produce of seven acres.

Mangolds.—Mangolds are planted on the flat, as are all other crops on this farm, the idea being that in the case of land laid out as at Bedford in short plots on a quick fall, the sewage is more readily applied to the crop on the flat than if the crop were planted on ridges; for if the ridges ran with the fall, the sewage would rapidly flow down the comparatively short length of the fields into the ditches at the bottom; and if the land is ridged across the fall, even if every ridge was an exact contour of the land, very uneven distribution of the sewage would take place. The objection to the flat system adopted at Bedford, on account of the physical features of the land, appears to be that the sewage is liable to pond in places, on account of the unevenness of the ground, and that the growing crop is liable to be soiled by direct contact with the sewage. The mangolds are drilled in rows 26 inches apart, and are hoed out to 12 inches from plant to plant, the quantity of seed sown per acre being 5 lbs. The early sown mangolds, both here and on other farms, have run to seed. The mangolds on this farm are a good plant; one field especially, which was sewaged in the winter, was capital; they are irrigated from time to time during the period of growth.

Onions.—The seed is drilled in rows 8 inches distant. The bulbs of the onions should be from 4 inches to 6 inches apart in the rows. The quantity of seed sown is from 8 lbs. to 10 lbs. per acre, depending upon the quality of the land and the time of sowing. The cost of cleaning this crop is about 5*l.* 10*s.* per acre in ordinary seasons. This year the wet weather has interfered very much with the cleaning, and the weeds have been a great trouble. The onions are thinned out the second time of cleaning. This crop was very fair for the season, but in places where the water lodged the plant was destroyed. The crop is not irrigated with sewage while growing, but sewage is applied to the land before the seed is sown.

Cabbage.—This was a good crop, considering the severe winter, and sold at 8*d.* per dozen, delivered on rail for Manchester. Cauliflowers are usually planted in June and cleared in October. It is a crop that answers well on this farm. Both cabbage and cauliflowers are planted in rows, so that the plants are 2 feet distant from each other. The land previous to planting is marked out both ways with a drill. The precision thus gained in planting the crop is found to give greater facility for afterwards using the horse-hoe.

Prickly Comfrey.—A small quantity of this crop is grown for horse-fodder. The roots were planted in March 1878, and the crop was cut three times in that year. The roots are planted 24 inches apart each way, and the crop is said to take any amount of sewage. The manager states that he believes it to be impossible to damage this plant with sewage, for the crop had been continuously flooded with sewage for three weeks in succession, and this treatment was found more beneficial than otherwise.

Carrots.—Carrots are drilled in rows about 12 inches apart, and the plants are from 4 to 6 inches distant in the rows. Carrots are not sewaged during their period of growth. The crop, which did not appear to be a very good one, has, we learn, been sold, and produced nearly 16*l.* 10*s.* per acre.

Parsnips.—The parsnips were a very fine crop; they are drilled in rows about 12 inches apart, and the plants are from 8 to 10 inches apart; 7 lbs. of seed per acre is used.

Swedes.—A small quantity of swedes are grown, but they have not been sewaged. They are drilled in rows 24 inches distant, and the roots are hoed out to 12 inches apart. Three pounds of seed per acre is drilled.

Rhubarb.—A small quantity of rhubarb is grown, but on that part of the farm which is seldom sewaged. The roots are placed at a distance of 4 feet apart, and they are moved once in every five years.

Wheat.—Red Browick is the variety grown. The crop was level, heavy, and good, and followed potatoes. The land had not been sewaged for two years, and the crop was not sewaged during the period of growth.

Oats.—White Polish are the sort grown; they were a very good and heavy crop. This crop was sown on land in which parsnips and mangolds had been grown the previous year. The parsnips had not been sewaged when growing; the mangolds were sewaged while under cultivation. The oat crop looked much better on the part following the mangolds than on that following the parsnips. This crop, like all other cereal crops, is not sewaged during the period of growth.

Barley.—This was a heavy crop, but lodged. It was sown on land that had grown mangolds the previous year, and the land had been sewaged after the mangolds had been removed at the end of the year 1878.

Celery.—Celery is grown on this farm, and it is found to be one of the best sewage crops grown. The trenches for the reception of the young plants are well sewaged before planting, and the crop is greatly benefited by the frequent dressings of sewage during the period of growth. The sewage is applied between the rows.

Lettuces, asparagus, and other small garden crops, are grown on land that receives an occasional dressing of sewage.

Rotation of Cropping.—A portion of this farm being liable to flooding, it is found impossible to carry out, on this account, any regular system of rotation of cropping. On some of the land the following system is observed:—1st, rye-grass for two years; 2nd, mangolds; 3rd, wheat or oats; 4th, onions or potatoes, followed by rye-grass.

Horses.—Six strong Shire-bred horses are employed on this farm solely for working the land and other farm operations. In the summer the horses are principally fed on rye-grass, and in the winter with beans, oats, and chaff, with a considerable amount of roots, carrots being generally used until Christmas, and mangolds afterwards. The manager reported that this course of feeding keeps the horses particularly healthy. He also reported, in answer to special inquiry, that he never had a greasy-legged horse on the farm, and does not consider the horses on the sewage farm more liable to that or any other disease than on farms under ordinary cultivation. He further reported that the veterinary surgeon's bill on this sewage farm, during the last four years, averaged about 3*s.* 6*d.* per horse.

Sanitary.—Eight persons reside on the farm, six of whom are children, and about twenty men and boys are engaged on the farm, who do not reside on it. Mr. J. H. Collett, the farm manager, reported—" No man, either living or working on the farm, or any man living near, has ever suffered from any epidemic disease.

" No man ever employed on this farm for a sufficient length of time to have felt the ill-effects of sewage has died up to the present time, neither has there been a death of any resident, young or old.

" I can give you no other information on this point excepting that my men have been particularly healthy, and I have never heard the men employed on this, or the adjoining farms, or any person living near, ever complain of injury or annoyance from our utilisation of sewage."

CLASS 1.—WREXHAM SEWAGE FARM.

THE Wrexham Sewage Farm is the property of P. B. Davies-Cooke, Esq., and is rented by the Corporation of Wrexham at 320*l.* per annum. It is now underlet to Lieut.-Colonel Alfred Stowell Jones, V.C., on a lease for nineteen years, which will expire in the year 1891. Twenty acres of additional land are rented by Lieut.-Colonel Jones from Sir Roger W. H. Palmer, Bart., at 2*l.* per acre. The entire farm covers an area of 104 acres, made up as follows:—

	Acres.
Arable	49⅔
Pasture..	51
Roads, site of buildings, &c. ..	3⅓
	104

The sewage of the town of Wrexham, which contains a population of 10,000 persons, flows by direct gravitation on to this farm. At the head of the farm are placed a pair of settling-tanks, into which the sewage flows, and in which the solid matters subside, the liquid flowing from these tanks being distributed over the land by means of earth-cut carriers, except in a few instances where the carriers are earthenware pipes. All the sewage that finds its way into the tanks is passed on to the farm. There is, however, a storm-water overflow at the entrance into the tanks, and we were informed that there were others in the district. The quantity of liquid sewage conveyed on to the farm varies from 300,000 gallons per diem in dry weather to 500,000 gallons in wet weather. All excess beyond the latter quantity flows by storm-water overflows into the adjacent brook, and we observed at the time of two of our inspections that the overflow at the entrance to the sewage-tanks was acting. The solid matters taken out of the tank are first allowed to drain, and then they are thoroughly dried and sifted; a Gibbs's fan and cylinder, driven by a portable steam-engine, is used for drying the sludge, which is previously sold to the Wrexham Manure Company, who make a manure called the "Farmer's Friend." We were informed that 172 tons of this manure were sold in 1878 at 6*l.* 10*s.* per ton, and that each ton consisted of—

1 cwt. sulphate of ammonia.
7 cwts. fine raw bone-meal.
12 cwts. dried sewage-sludge.

1 ton.

About 300 tons of dry sludge is annually removed from the tanks. What is not disposed of for making artificial manure is used directly upon some portions of the land, or is sold to neighbouring farmers.

The land for the most part is of a light sandy character, containing peat or vegetable matter, upon a subsoil of gravel and sand. Experiments made with the soil show that a sample taken from Stanstey Meadow absorbed 57 per cent. of its weight of water, and a sample taken from the market-garden land absorbed as much as 70 per cent. of its weight of water. The absorbent character of these soils is due to the large amount of organic matter present in them.

About four acres of the farm have been under-drained with 6-inch and 8-inch pipes, six feet deep and forty yards apart. Isolated drains, constructed with 3, 4, and 6-inch pipes, have been laid in wet places on the farm, where required, at a depth of 3 feet 6 inches. There is very little surface effluent flowing off the farm. The under-drains, however, were flowing freely at the time of our inspections, the effluent from these under-drains being clear and apparently very pure.

The amount of capital expended by Colonel Jones in preparing the land for the reception of the sewage has been as follows:—

				£	*s.*	*d.*
Buildings				160	12	3
Drainage				122	9	4
Sewage carriers				181	6	5
Preparing land for sewage				280	5	5
Roads and fencing				190	16	0
Total first cost				£935	9	5
Amount of Capital paid off:—						
1874	£16	14	1			
1875	23	19	0			
1876	27	10	0			
1877	35	0	0			
1878	40	0	0			
				143	3	1
Present charge against farm				£792	6	4

Previous to Colonel Jones taking the farm, something like 400*l.* had been expended in preparing the land, the principal work having been the formation of a pipe-carrier for the conveyance of the sewage, which Colonel Jones informed us he had to take up and relay, and the sum of 700*l.* had been expended in the construction of settling-tanks.

The following statements give the balance-sheets of the working of this farm for the last three years:—

WREXHAM SEWAGE FARM.

STATEMENT OF ACCOUNTS FOR THE YEAR ENDING 1ST FEBRUARY, 1877.

INCOME.	£	s.	d.	EXPENDITURE.	£.	s.	d.
Valuation, 1st February, 1877	2369	5	7	Valuation, 1st February, 1876	2150	18	1
Sale of Wheat	57	14	6	Rent	387	15	11
„ Oats	8	0	0	Cattle	22	0	0
„ Mangolds and Swedes	88	8	5	Wheat for Seed	7	6	0
„ Grass	151	12	5	Potatoes	2	8	0
„ Hay and Straw	41	12	10	Other Seeds	15	15	10
„ Potatoes	68	3	2	Implements purchased	78	5	6
„ Cabbage and other Garden Crops	237	11	10½	„ repaired	5	6	2½
Provender for Dairy Cows	381	11	6	„ hire of	2	18	0
„ Carriage Horses and Ponies	90	0	0	Blacksmith	6	6	11
Sale of Cattle	109	10	0	Provender	30	5	0
„ Milk	54	19	8	Artificial Manure (salt)	1	10	8
„ Manure	54	10	9½	Wages	447	19	11
Grass keep	28	12	0	Rates, Tithes, and Taxes	64	9	9
Rents	13	0	0	Railway Bills	6	14	2
Miscellaneous	6	18	6	Beer for Labourers	3	17	6
				Drain Pipes	9	3	4
				Garden Shed and New Bridge	38	11	5½
				Fire Insurance	3	7	0
				Coals, 18*s*., Stallions, 25*s*.	2	3	0
				Mole-catcher	1	0	0
				Commission allowed on Sales	10	8	0
				Market Tolls	4	3	5
				Balance Profit	458	17	7
	£3761	11	3		£3761	11	3

WREXHAM SEWAGE FARM.

Statement of Accounts for the Year ending 1st February, 1878.

INCOME.	£	s.	d.
Valuation, 1st February, 1878	2,410	10	1½
Sale of Wheat	21	17	6
,, Barley	49	0	0
,, Oats	14	17	4
,, Mangolds	65	4	6
,, Grass	91	7	9
,, Potatoes	33	4	0
,, Hay and Straw	33	10	0
,, Cabbage and other Garden Produce	231	1	5½
Provender for Dairy Cows	379	17	7½
,, Carriage Horses and Ponies	90	0	0
Sale of Cattle	18	5	0
,, Horses	21	0	0
,, Milk	42	4	11
,, Manure	43	18	1½
Grass Keep	18	5	0
Rents	13	0	0
Farm Labour and Carting for the Wrexham Manure Co.	21	11	5½

EXPENDITURE.	£	s.	d.
Valuation, 1st February, 1877	2,369	5	7
Rent	386	6	9
Wheat for Seed	6	6	0
Barley ,,	6	15	0
Oats ,,	5	6	0
Potatoes ,,	4	2	6
Other Seeds	25	13	4
Implements purchased	8	3	0
,, repaired	26	9	8
,, hire of	8	7	4
Blacksmith	4	15	5½
Provender	13	11	8
Artificial Manure (Lime)	3	19	4
Wages	464	5	6½
Rates, Tithes, and Taxes	68	19	10
Railway Bills	9	17	0
Veterinary Expenses	1	6	6
Beer for Labourers	4	3	9
Drain Pipes	1	11	0
Coals, 14s.; Stallion, 25s.	1	19	0
Mole-catcher	1	0	0
Commission on Sales	16	18	10½
Market Tolls	1	11	0
Miscellaneous	5	7	3
Fire Insurance	3	7	0
Balance Profit	149	6	5

WREXHAM SEWAGE FARM.

Statement of Accounts for the Year ending 1st February, 1879.

Income.	£	s.	d.
Valuation, 1st February, 1879	2,467	1	5½
Sale of Wheat	32	3	6
,, Oats	19	16	7½
,, Mangolds	28	1	1
,, Grass	90	1	4½
,, Cabbages and other Market-garden produce	252	15	3
,, Potatoes	35	0	0
,, Hay and Straw	19	1	1
Provender for Dairy Cows	361	6	8
,, Carriage-horses and Ponies	90	0	0
Sale of Calves	5	2	6
,, Milk	51	12	6
,, Manure	58	8	8½
Grass Keep	8	0	0
Rents	13	0	0
Carting dried sludge to Railway Works	9	18	9½
	£3,541	9	6½

Expenditure.	£	s.	d.
Valuation, 1st February, 1878	2,410	10	1½
Rent	386	6	9
Cattle	24	0	0
Oats for Seed	6	3	0
Potatoes	4	4	0
Other Seeds	10	0	8
Implements purchased	5	14	9
,, repaired	5	19	0
Blacksmith	5	11	10
Provender	11	2	10
Wages	446	11	6½
Rates, Tithes, and Taxes	86	14	3
Fire Insurance	3	7	0
Beer for Labourers	5	12	6
Coal, 15s.; Stallion, 25s.	2	0	0
Mole-catcher	1	0	0
Commission on Sales	12	0	0
Market Tolls	2	2	5
Balance Profit	112	8	10½
	£3,541	9	6½

With reference to the valuation, the sum of 670*l.* has been added to Colonel Jones's valuation to cover the cost of stock which has been sold to the sub-tenant, Mr. George Jackson; and, by agreement with Colonel Jones, this stock is kept on the farm. The resident dairyman on the farm, under agreement with Colonel Jones, is bound to keep not less than 25 nor more than 30 cows, and he pays Colonel Jones 5*s.* per week each for grazing cows in one meadow. When this fails, he purchases what hay, mangolds, turnips, cabbages, or rye-grass he may require at 25 per cent. under market-price on the ground; and he purchases straw at 50 per cent. off the market-price, taking it from the machine, or 30 per cent. under market-price if taken from the stack, and he leaves all the manure on the farm. He is also allowed to keep three horses, a number of pigs and poultry on the farm, but not geese; and he pays 5*l.* per annum rent for the house and garden.

The arable land on this farm might in parts have been somewhat cleaner, but the fences and roads were in good order, especially when the naturally poor growth of the fences is taken into consideration.

The cropping of the land for the past year (1879) has been as follows:—

	A.	R.	P.
Pasture—Hay, grazing spring and autumn	34	0	0
„ Grazing only	17	0	0
Arable—Italian rye-grass..	16	3	0
„ Black Tartarian oats	11	0	0
„ Barley	6	0	0
„ Mangolds	6	3	9
„ Swedes..	0	2	17
„ Market garden	5	0	0
„ Potatoes	3	0	0
Wrexham Manure Co.'s sheds and drying-grounds	0	2	0
For Shone's experiments, pneumatic sewerage system	0	2	0
Roads, house, garden, stackyard, &c.	2	3	14
Total acreage of farm	104	0	0

Rye-grass.—This is the chief crop cultivated on this farm. The seed is usually sown about the 1st of April at the rate of two bushels per acre, and the first cutting of the fresh-sown crop occurs in July. The crop is allowed to stand three years, and is generally cut four times the first year, six or seven times the second year, and four or five times the third year. The weight of rye-grass grown in the three years, on an average, is nearly 40 tons per acre per annum. It is copiously irrigated with sewage after every cutting of grass. The crop is sold partly to a dairyman, whose stock is on the farm, and partly to general customers, and generally realises about 9*d.* per cwt. The cutting of 1879 was quite one month later than usual. Grass that cannot be disposed of green is made into hay. Attempts have been made on this farm to artificially make the rye-grass into hay. For this purpose the grass was cut in its green and fresh state with a chaff-machine, and the short-cut grass was then passed into the drying cylinder of a Gibbs's machine. The chopped hay produced is said to have contained, when so dried, from 20 to 25 per cent. of moisture. When put up for store, instead of heating and further drying, it turned mouldy and was spoilt.

Mangolds.—This crop is grown on ridges, which are 27 inches apart. The plant is hoed out to 12 inches distance in the rows, and 6 lbs. of seed per acre are sown. Long red is the favourite variety grown on this farm, and it is usually taken after a straw-crop with the aid of sewage. The crop receives four or five dressings of sewage during the period of growth. The mangolds were sown on the 3rd of May, and were a very good crop—in fact, the best (as a whole) we saw during our inspections on any farm. The quantity of mangolds grown per acre varies from 30 to 46 tons, and it is found that these sewage-grown mangolds will keep well in the clamp until they are all sold, and not unfrequently they are kept a long time. It is not considered that the climate is well suited to the growth of mangolds.

Potatoes.—This crop is grown in ridges at 27 inches' distance apart, and the tubers are 14 inches from each other on the ridge. "Champions" are the best sort that has been tried. No liquid sewage is applied to the crop. The land is dressed with farmyard-manure or sewage-sludge. The potatoes in 1879 were an excellent crop.

Oats.—"Scotch Black Tartarian" is the sort grown. The oats of 1879 were sown on the 4th of April at the rate of 3½ bushels per acre, and seemed a remarkable crop, looking well. In a former year we were informed that they yielded 78 measures of 46 lbs. each per acre. The crop is not directly sewaged, but follows in regular rotation the growth of rye-grass, which receives a large quantity of sewage. Part of the crop of oats of 1879 was seeded with permanent grass and part with rye-grass at the time of sowing.

Barley.—A crop of this grain was growing on poor land. Although in the early part of the season it did not look well, yet it turned out in the end a very good crop. The barley is not directly sewaged, but the land had been manured with sewage-sludge. The 1879 crop was sown on the 18th of April, at the rate of 2½ bushels of seed per acre, and followed turnips, which had been previously grown on the land.

Wheat.—There was no wheat-crop growing on the farm in 1879, but it is occasionally grown instead of oats in the regular course of rotation of cropping pursued. Scholey's Square-headed Wheat is the variety grown. It is not sewaged during the period of growth, and is sown at the rate of 3 bushels of seed per acre after rye-grass.

Market-Garden.—A portion of this farm is laid out for a market-garden, and produces cabbages, carrots, beans, French beans, peas, onions, lettuce, radishes, spinach, rhubarb, and strawberries. The land for these crops receives a dressing of farmyard-manure. The crops for the most part are planted on ridges, and are sewaged at intervals depending upon the weather, the sewage being applied more for the sake of watering them than for manuring the crop, except in the case of cabbages, celery, and rhubarb, which will take a considerable quantity of sewage.

Permanent Grass and Old Turf Land.—The grass-land on this farm receives very heavy dressings of sewage in the winter months. During the severe winter of 1878–9, all the sewage was applied either to the grass-land or to fallow-land; and we were informed that the grass-lands on this farm had been used for skating during the severe frost. The grass-lands did not look well at the time of our first inspection, after the frost had gone; and at that period (14th of February) the land was still receiving copious supplies of sewage. A considerable amount of thick deposit was observable about the sewage-carriers and on the low spots, but this deposit did not kill any grass. This same land, later on, showed no signs of injury from the application of the sewage-water under such adverse circumstances, but after having been grazed to the 27th of May it grew all over it a very good hay-crop, which was purchased by the resident dairyman, and was again grazed in the autumn. A meadow which is used exclusively for grazing is contoured with carriers, and is occasionally irrigated.

Rotation of Cropping.—The rule observed on this farm is first, for three years, rye-grass, followed in the fourth year by wheat or oats, in the fifth year mangolds, and in the sixth year a return to rye-grass.

Cattle.—Colonel Jones has but two cows of his own, having disposed of his stock to a dairyman for the sum of 670*l.* The stock is, however, all kept on the farm under the terms of the agreement already referred to, and the value of this stock is included in the farm valuation, but none of the tenant's plant is included in the valuation. At the time of our inspection there were twenty-six cows in milk, three dry, and six calves, and also one bull on the farm. The dairy stock is tied up all the winter and part of the summer. In the summer the cows are fed on Italian rye-grass night and morning, and graze in the meadow. In winter they are fed on hay, mangolds, cabbage, Indian-meal and grains. The cows are bought in from time to time as required, and are sold off when dry. The calves are sold mostly for rearing, but some few are sold fat to the butcher. Two or three are invariably kept for the renewal of the stock. The calves are never allowed to suck the cows, but are reared on skimmed milk and linseed. The average yield of milk is about 1½ gallon per cow per day, and the price realised for the milk, when sold night and morning in Wrexham, at the time of our inspection, was but 2*d.* per quart, the usual retail price being 3*d.* per quart. Barren cows are fed and sold to the butcher. The bull is a two-year-old Shorthorn, bred by Sir Watkin W. Wynn, by "Duke of Clive." The health of the cattle was reported as good, for, with the exception of a very mild outbreak of foot-and-mouth disease and an occasional case of milk-fever, no cow has been sick during the past eight years they have been kept on this farm.

Horses.—Fourteen horses and ponies are kept, twelve of which are the property of Colonel Jones, and two the property of Mr. Jackson, the resident dairyman. Two horses and two ponies belonging to Colonel Jones are exclusively used for private purposes. There are three cart-horses, and the remainder is made up of young horses and ponies bred on the farm. The horses working on the farm are also employed in carting sewage-sludge for the Wrexham Manure Company. The health of the horses is very good. Colonel Jones reported that the horses are not subject to any disease, and that he "never knew a healthier lot, and I have had to do with many horses all my life." The horses get no corn, and nothing but rye-grass from May to November, and in the winter rye-grass and meadow-hay, home-grown oats, and Indian corn; and they are in constant work in all weathers.

Pigs.—About ten pigs were on the farm; one breeding sow and store pigs are usually kept. They are fed on skim-milk, garden-stuff, Indian meal, and swill procured from the neighbouring barracks.

Sanitary.—Eleven persons reside on the farm, including eight children, and about eight other men work on the farm, who do not reside thereon.

Colonel Jones reported that, "The children have had whooping-cough, mumps, and measles, and that, besides these, one slight case of acute rheumatism, and common catarrhs and coughs have been the only diseases of any kind endured by the men who reside on the farm, or any of their families, or by those of men regularly employed on this farm. No children of persons resident on the farm, and none of the men regularly engaged on the farm have died."

CLASS 1.—ALDERSHOT SEWAGE FARM.

THIS farm is the property of the Secretary of State for War, and, when in a state of common, in 1864, was let to Mr. James T. Blackburn, on lease for sixteen years, rent free, together with the sewage flowing from the Camp at Aldershot, containing a population of about 8000 persons.

The farm contains about 104 acres, 99 of which are under sewage cultivation, the remaining portion being occupied by buildings, cottages, gardens, roads, fences, &c. It is situated on the Bagshot Sands, and consists of a light sandy soil upon a subsoil of ferruginous gravel. Experiments have been made upon this soil as to its power of absorption, and, on an average of three experiments, the soil is shown to be capable of absorbing 36·2 per cent. of its own weight of water, a quantity which indicates that the soil is of a porous character, as will be seen by reference to similar experiments upon the soil of other sewage farms which have been examined. The land was originally not worth 5*s.* per acre, but its value under the judicious management of Mr. Blackburn has been very considerably increased. For some years after being brought into operation, the farm was carried on at a loss to the tenant, but an examination of the accounts now shows that the farm pays its way.

About 6000*l.* have been expended in preparing the land for the reception of the sewage, in the construction of sewage-tanks and carriers, the erection of farm-buildings, bailiff's lodge, and cottages, and in the formation of roads. This sum was provided by the Secretary of State for War, in the shape of an annual subsidy extending over a series of years, but the amount was found and expended by the tenant in the very beginning of the operations on the farm. We were informed that prior to the sewage being taken on to this land, and the expenditure of this money on works, it cost the authorities 1600*l.* a year to deal with the sewage at the Camp in a very unsatisfactory manner.

The sewage flows upon ninety acres of land by direct gravitation; and is delivered in a fresh state, and is much stronger than ordinary town sewage. All the sewage goes on to the land. There are storm-water outlets provided in the Camp, but we were informed that they only partially acted, and that there is no mode of diverting the sewage so that it can pass by the farm into the streams of the district, but all of it has to pass on to the farm. At the time of our various visits, a considerable quantity of effluent water was flowing from the drains of the farm. This water was bright, clear, and free from offensive matter, and was evidently much purer than the stream into which it was discharged. The solids of the sewage are removed by subsidence in small tanks placed at the head of the farm, and only the liquid sewage flows directly on to the land which is irrigated. The solids collected in these subsidence tanks are occasionally flushed out through the main carrier into three sludge-tanks, which have been formed at a lower point on the farm. These sludge-tanks were constructed by simply throwing up the earth into banks, and protecting the slopes with a coating of gravel mixed with tar. They are each about 37 yards long, 7 yards wide, and 2 feet 6 inches deep. The solid matter remains in these sludge-tanks a sufficiently long time to allow it to drain and consolidate so as to be easily carted upon the land, when required, at certain seasons of the year. Near the lower portion of the farm an engine-house, a high-pressure steam-engine, and pumps have been erected; these can be used either to pump sewage on to the nine acres of land which cannot be commanded by gravitation; or in the summer and during dry periods water can be raised from a stream in the neighbourhood for diluting the sewage; or a portion of the effluent water from the sewage farm can be again thrown over the land. The liquid sewage is conveyed over the farm through earth-cut carriers, the sides of which are protected with grass sods laid one upon another, and the land, which has a gentle slope, has been laid out as nearly as possible in five-acre plots, each plot being again subdivided by carriers for the convenience of irrigating, cutting, and removing the crops. Rye-grass cutting is commenced at the bottom of each plot and continued upwards, so that when the bottom of the plot is cleared of the crop it may be again irrigated without interfering with the crop upon the upper portion of the plot. The sewage is distributed by means of contour carriers, which are ploughed out from time to time when the crop is ready for the reception of the sewage. Portions of the ground which required drainage have been under-drained to a depth of from 4 to 6 feet, the drains being from 30 to 60 feet apart.

Mr. Blackburn has grown all sorts of crops upon the land, but he now devotes his attention to the cultivation of rye-grass, potatoes, and rhubarb. The cropping of the year 1879 was:—

	Acres.
Potatoes	57¼
Rye-grass	40
Rhubarb	1½
Cabbage plants	¼
Total	99

Rye-grass.—As a rule this crop is not allowed to stand longer than two years, and the greater portion for only one year. It is generally sown in September and October, following potatoes, after the land has been grubbed and cleaned, 2 to 3 bushels of seed to the acre being sown. The seed is all grown upon the farm, the second crop of the second year being selected for seed. From 4 to 6 quarters of seed per acre are grown, and at the same time about 1½ to 2 tons per acre of ryegrass-hay are made. This home-grown seed is found by experience to be far superior to any bought seed. In no case has the rye-grass upon this farm been allowed to stand for three years, as in the case of some of the other sewage farms we visited, but after the second year it is ploughed up for potatoes. The rye-grass is sold to cow-keepers on the land, and to contractors for the use of horses, a nominal quantity only being reserved for special customers and for one cow kept upon the farm for the purpose of supplying the farm-bailiff and his family with milk. The grass is sold at so much per acre in the spring, the purchaser doing what he likes with it. Both this year and last year, in consequence of the abundance of feed, a considerable quantity of the grass was made into hay. The long frost and snow of the winter of 1878–9 killed a portion of the newly-sown grass, but, by re-sowing in the early spring, before the summer a good and uniform crop appeared all over the land. The first crop of rye-grass upon this farm was cut in 1879, on the 1st of April, which is a month later than cutting took place in the previous year. Usually the rye-grass is cut four, five, and six times a year, depending on whether it is to be used for horses, cows, or other cattle.

Potatoes.—Potatoes are the chief crop grown upon this farm, and in their cultivation Mr. Blackburn has had great experience, and has elicited valuable results as to the varieties which are best adapted for sewage culture. In preparing the land for potatoes, an ingenious skim-coulter is used, attached to the plough, by the aid of which the rye-grass turf is completely turned over and buried. Prior to the planting of the potatoes the land receives a dressing of from 3 to 4 cwt. per acre of superphosphate of lime. The potatoes are all planted on ridges, these ridges being 26 inches apart, and the plants 12 inches distant from each other on the ridges. The varieties of potatoes best suited for sewage cultivation are found to be those imported by Mr. Blackburn direct from America. Disease has never troubled this crop much, but all sorts of English potatoes produce too much haulm. The American potatoes grow with little top and answer much better than English seed. About 12 cwt. of seed potatoes are planted to the acre, and the usual yield is about twelve-fold. Several varieties of potatoes are grown so as to come into the market in succession. This crop is usually sold on the ground. The potatoes are not irrigated with sewage during the period of growth, but depend for their fertilising matter upon the decay of the grass roots, and upon the previous supply of sewage applied to the land; also to the solid matter which has been applied and ploughed into the land, to the phosphate dressing, and to the stable-litter brought on to the farm.

Rhubarb.—The rhubarb is grown from plants placed at a distance of 3 feet apart, the ground having been deeply trenched and well-manured with stable-manure previous to receiving the plants. The crop is grown for three years, when the selected roots are re-divided. The crop receives liquid sewage during the period of its growth, and is sold for market up to the 1st of June, after which period it is cultivated for wine manufacture. At the end of August the pulling of the crop ceases. In the winter the crop is protected by a slight covering of stable-litter.

General Remarks.—Until recently a large number of cows were kept on the farm by a sub-tenant. During the past year, however, only one cow was kept, to which reference has already been made. Four horses are kept for the purposes of cultivation —two Clydesdale and two English horses. Experiments upon the cultivation of mangolds on this farm show that the soil is not capable of producing anything like the weight of mangolds grown on other sewage farms; and on this account, and in consequence of the small sum realised for them, the cultivation of this crop has been abandoned. The long spell of wet weather last summer had a most damaging effect upon the yield of potatoes on this farm. The heavy rain on the 28th of May last, and the continuous rains throughout the season, flooded a large portion of the farm, and here and there several acres of potatoes were actually killed by it. The superabundance of moisture appeared to have entirely destroyed the fertility imparted by the sewage, and although the land was fairly tilled and kept free from root-weeds, in all the low spots the annuals were to be seen. Mr. Blackburn reported that since this farm has been under sewage, although every year a large quantity of potatoes has been grown, there has not been, on an average, more than one sack of diseased potatoes each year. Whether this result is due to the special variety of potatoes cultivated, to the application of the sewage, or to the use of gas-lime, with which the land is occasionally dressed, are points that merit further investigation. There are many features in the management of this farm that appear to us worthy of the highest commendation; and we regret that, owing to the peculiar circumstances under which the tenant is placed in reference to the near approach of the expiration of his lease, we cannot present a balance sheet showing the results of his operations.

Sanitary.—The farm has been in existence for fifteen years. Twenty-five persons are either employed or live on the farm, including twenty-two residents, twelve of whom are children. Mr. Blackburn states: "No death has taken place among the men, some of whom have worked steadily on the farm without a day's illness since it was started. No children have died on the farm during its existence as a sewage farm. None of the men, or their families, have ever been subject to any epidemic disease, in fact, nothing worse has occurred than an increase in their appetite. I have never heard, experienced, or seen any ill-effects to health from the working of this farm. I lived on the farm for six years, during which time I was at least ten hours a day superintending its details, and was never more than three or four days away at one time."

CLASS 1.—GUISBROUGH SEWAGE FARM.

THIS farm, if farm it can be called, is the property of, and is carried on by Admiral Chaloner, under the management of his agent, Mr. J. W. Clarke. It was established in the year 1870. It is situated in a sheltered valley, and is a fairly successful and a most interesting experiment. It shows what may be done by a landowner desirous of serving the interests of the neighbouring town, and how the sewage of a large population may be disposed of upon a comparatively small plot of land, as in this case the sewage of at least 330 persons is disposed of upon one acre of land so as to be rendered comparatively harmless, and this is done without any loss to the landowner.

	A.	R.	P.
The acreage of land used for sewage purposes is ..	16	0	8
Waste land, embankments, &c., from which a hay crop is taken	5	2	8
Roads, streams, &c.	2	2	21
	24	0	37

This land receives the sewage of the town of Guisbrough, which contains a population of 5300 persons. Admiral Chaloner pay the authorities of Guisborough 5*l.* per annum for the sewage, which has been taken on lease for the purpose of disposing of it. The town of Guisbrough is also supplied with water from waterworks established by Admiral Chaloner. About 70,000 gallons of water per day are supplied from the waterworks to the town, in addition to which there are a number of local wells. The sewers receive the surface-drainage and rainfall of the district, including the drainage from the roads.

The sewage is conveyed by gravitation on to the land. When the outfall sewer was originally constructed it was made to discharge into duplicate covered tanks, but a dam 18 inches high has been placed in the old 3-ft. by 2-ft. outfall sewer at a point above the tanks. From the covered tank there is an overflow into the contiguous brook. The new outfall sewer to the farm commences above the dam in the old outfall sewer, and the sewage is conveyed lower down the valley on to the land prepared for its reception. At a point at the head of the sewaged land there is an overflow into the brook. Both this overflow and the one at the old tanks were found to be acting at the time of our visit, on the 18th February, 1879. The sewer which conveys the sewage on to the land is a 15-inch earthenware-pipe which, at a lower point on the land, bifurcates into 12-inch pipes. These pipes form the main carriers, and are laid in embankments, from which 6-inch branch drains distribute the sewage on to the land. These branch drain-outlets are placed at distances of about 11 yards apart along the main carriers. The sewage is distributed over the surface of the land in earth-cut carriers, which are formed from time to time to suit the nature of the crop or the land to be treated. The whole of the land is under-drained. The main drains are 8 inches and 6 inches in diameter; and the branches vary from 4 inches to 3 inches in diameter, and are 5 feet 6 inches deep, clay jointed. The subsidiary drains are about 5 feet deep, all clay puddled at the joints, and are laid at distances of about 11 yards apart. In one or two places where spring-water was met with the drains were laid at 5 yards apart.

The soil is an alluvial deposit, mostly clay, with a vein of gravel, and it cannot be regarded as favourable for the purpose of being used as a filter for sewage. The lighter soil contains vegetable or peaty matter. On an average of three experiments it was found to absorb 54·6 per cent. of its weight of water. An average of three experiments on a more loamy sample of soil showed that this description would absorb 49·3 per cent. of its weight of water. The colour of the soil is red, this colour being imparted by the presence of iron, and as there are tan-yards in Guisbrough, and the waste of the tan-yards finds its way into the sewage, the effect of the tan-water coming in contact with the iron of the soil is to impart to the effluent sewage a decidedly inky hue.

We cannot say that the effluent passing from the drains is always pure, as there were indications that the unpurified sewage occasionally finds its way through the land into the drains. This is usually the case where land of this character is under-drained, as the effect of under-drainage is to cause the ground to dry and shrink, thus leaving minute fissures or cracks through which the sewage will pass into the drains, in certain seasons of the year, with little or no purification.

The cost of preparing the land for the reception of the sewage has been somewhat heavy. Large quantities of earth have been excavated, and the valley has been considerably widened in the bottom by the excavations from the sides. The sum of 1691*l.* 11*s.* 8*d.* has been expended on the works, being at the rate of over 105*l.* per acre. It should be said in reference to this capital, that five per cent. every year has been charged in the farm accounts in addition to the rents, which are the same as those paid for the land before the sewage farm was established, and in the year 1878 as much as 66*l.* 9*s.* was charged for interest. The farm, however, has earned, after paying rent, interest, and all expenses, in the eight years since it was established, the sum of 373*l.* 5*s.* 6½*d.*, which has been applied to the reduction of the capital, which is now 1329*l.* 2*s.* 10½*d.* The balance of profit and the yearly value of the crops, as abstracted from the farm accounts since 1871, have been as follows:—

PROFIT AND LOSS ACCOUNT.

Year.	Loss.	Profit.	Value of Crop, calculated on Sewage Area, per Acre.
	£ *s.* *d.*	£ *s.* *d.*	£ *s.* *d.*
1871	..	2 7 7½	11 5 0
1872	47 3 5	..	12 0 0
1873	..	45 3 2	17 1 6
1874	..	163 0 10	24 6 0
1875	..	140 10 11	26 6 5
1876	..	50 6 3	19 19 1
1877	..	8 3 5	15 16 3
1878	..	10 16 9	16 5 0
	£47 3 5	£420 8 11½	
Deduct Loss ..		47 3 5	
Profit		£373 5 6½	

The foregoing return shows that the value of the crops per acre has considerably declined during the past three years. This, we were informed, was principally due to the depression in the iron trade in the district, in consequence of which there had been by no means so great a demand as previously for agricultural produce of the character grown on this farm.

We have carefully examined the accounts of the farm for 1878, which are as follows:—

GUISBROUGH SEWAGE FARM.

STATEMENT of ACCOUNTS for YEAR ending 31st DECEMBER, 1878.

INCOME.	£	s.	d.	EXPENDITURE.	£	s.	d.
Sale of Rye-grass	153	4	6	Rent	37	10	0
,, Rhubarb..	15	1	6	Wages..	90	5	8
,, or valuation, Swedes and Turnips	30	14	5	Team-work	37	16	0
				Seeds	7	14	7
,, ,, Mangolds	47	0	9	Manure	10	10	0
,, ,, Carrots ..	16	0	10	Rates	6	0	0
,, ,, Hay ..	10	0	0	Sewage	5	0	0
				Balance-profit	77	5	9
	£272	2	0		£272	2	0

The valuation of stock-in-hand every year is included in the receipts for each crop. The accounts of the undertaking are well kept and regularly audited. From the item of profit, which appears in these accounts for 1878, the interest upon capital has not been deducted as in the table of the balance of profit before referred to, so as to assimilate these accounts with the accounts of other farms in which no interest is charged. With reference to the disposal of the produce, it should be observed that no crop is fed off on the land, and no stock is kept upon the farm. A large portion of the produce grown is sold to the estate at a rate somewhat less than that at which it is sold to the general public.

In winter the sewage is applied to fallow land. During the past winter (1878–9) five acres of fallow land were used for the reception of the sewage, the sewage flowing on to 2½ acres for one week, and being then diverted on to the other 2½ acres. After flowing on to this 2½ acres it was diverted back again, and so on throughout the whole of the winter, so that the sewage of over 1000 persons per acre was treated for four months of the year on 5 acres of land. It is intended, and the works were in progress, to extend one of the leading carriers lower down the valley, over which the sewage is intended to be distributed in time of storm, and in the winter on the rough grass-land in this part of the valley.

The cropping of the farm for the year 1879 was as follows:—

	A.	R.	P.
Rye-grass	10	0	25
Rhubarb	0	1	10
Turnips	2	3	13
Mangolds	2	0	0
Carrots	0	3	0
Waste-land hay	5	2	8
Site of cottage, roads, streams, waste, &c.	2	2	21
	24	0	37

Rye-grass.—This is the principal crop grown on this farm. The severe winter of last year, with frost and snow lying on the ground for a considerable time, almost entirely killed the crop, which, as a consequence, had to be re-sown in the spring. The new-sown crop was being sewaged for the first time in April, and, owing to the lateness of the season, the crop was cut three times last year. This crop is not allowed to stand longer than two years, and in this northern latitude it is found that it disappears at the end of that period. No sewage has been applied to the crop through the winter. Three bushels of seed are sown per acre, and, as a rule, one-half the rye-grass is ploughed up every year, and mangolds, swedes, or other root-crops follow in rotation. This crop realised in 1878, 15*l.* 15*s.* per acre. A considerable quantity of hay was made in 1878, which reduces the average value. In 1876 the average was 17*l.* 10*s.*; in 1875 the first year's rye-grass averaged 19*l.* 8*s.* 9*d.*, and the whole of the rye-grass 26*l.* per acre; the second year's grass realised 33*l.* per acre. Each plot was cut four times in 1875.

Mangolds.—This is a good paying crop, and the land appears to be well suited for its cultivation. It realised 23*l.* 10*s.* 4½*d.* per acre in 1878. The seed is drilled in rows on the flat at 24 inches' distance, the plants being about 1 foot from centre to centre in the rows. Last year's crop was drilled on the 13th of May, and had not run to seed, as in so many other places on sewage farms. The crop is irrigated during the period of growth. It has been observed that the mangolds grown on this sewaged area are always vastly superior to the ordinary farm mangolds of the neighbourhood.

Swedes.—This is a crop grown on this farm. It does not return anything like the amount realised for mangolds, nor will it take the same amount of sewage. The crop realised but 11*l.* 1*s.* 2*d.* per acre in 1878, but in that year they ran to seed. The seed is drilled on the flat in rows 24 inches distant, the plants being placed about 14 inches apart in the rows, and 5 lbs. of seed per acre are drilled. This crop receives very little sewage during the period of growth.

Carrots.—The crop was very late last year, and was not sown until the 12th of May, but it is usually sown in March. It is drilled in rows on the flat, 18 inches distant, the plants being 4 inches apart in the rows. Eight lbs. of seed per acre are drilled. The crop realised at the rate of 20*l.* per acre in the year 1878.

Rhubarb.—About a quarter of an acre of rhubarb is grown. The roots are planted about 4 feet distant, and the crop is sewaged. The right of pulling the crop is sold at the rate of 4*d.* per root for the season. This crop realised at the rate of about 48*l.* per acre; but it has been sold in prosperous times, as in 1875, at 131*l.* 15*s.* 5*d.* per acre.

Grass-land.—Sewage is now applied to the irrigation of some grass-land lower down the valley, for which purpose open contour carriers have been cut in the side of the valley, so that in time of storm, or at other periods when not required on the land specially laid out for the reception of the sewage, it can be turned on to these lands in order that it may be purified before passing into the stream.

Sanitary.—Eight persons reside on the farm, including four children; and one person works on the farm who does not reside upon it.

The farm has been in operation nine years, and all persons, whether living or working on the farm, have been perfectly healthy, and no complaints have been made of the farm.

CLASS 2.—LEAMINGTON SEWAGE FARM.

THIS farm is the property of the Earl of Warwick. The sewage farm proper is situated at Heathcote, near Leamington, and contains—

	A.	R.	P.
Grass-land	86	2	14
Arable land	284	1	19
	370	3	33

For the purpose of being worked with it, the Earl of Warwick's park, and some arable land contiguous, are attached. The areas of these lands are—

	A.	R.	P.
Grass-land	345	2	28
Arable land	47	2	10
	393	0	38

The total acreage of the land, therefore, is 764 a. 0 r. 31 p.

The farm is managed by Mr. David Tough, under the direction of Captain Fosbery, the Earl of Warwick's agent; and it receives the sewage of the royal borough of Leamington Spa, which contains a population of about 23,000 persons. This farm was established in the year 1871. The quantity of land irrigated in the seven years, from the 1st of January, 1872, to the 1st of January, 1879, is given in the returns which were handed to us, and from which it will be seen that in the year 1878, 161 a. 0 r. 10 p. of land were irrigated with sewage; the average quantity of sewage applied in this year having been 5553 tons per acre, or equivalent to an irrigation depth of 55 inches on every acre irrigated. The volume, however, given to different crops varies. In the case of rye-grass, as much as 11,912 tons per acre have been applied, which is equivalent to an irrigation depth of 117·8 inches; mangolds, 8265 tons per acre, which is equivalent to an irrigated depth of 81·83 inches; while upon land on which potatoes and savoys have been grown only 2275 tons per acre have been applied, or an irrigated depth of 22½ inches.

The soil of the farm varies in character. The greater portion, however, is very light land upon a gravel subsoil, but some portions are clay. Experiments were made with these soils, and it was found that the light land absorbed only 23·3 per cent. of its weight of water; soil of an intermediate quality between light and heavy absorbed 44·2 per cent.; while the heavy clay soil upon the farm absorbed 56 per cent. of its weight of water.

The sum of 15,369*l.* 13*s.* 1*d.* has been expended on capital account in preparing the land for the reception of the sewage, the construction of carriers and sewage-tank, and the erection of farm-buildings. The various items of expenditure under the head of capital have been as follows:—

	£	s.	*d.*
Buildings	1,546	7	2
Drainage	963	7	3
Sewage carriers	908	10	6
Sewage tank	72	6	0
Preparing land for sewage, rents during preparation of land, cost of improvements on land, including expenditure on park land	3,231	18	6
Road making and grubbing fences	306	0	2
Telegraph from pumping station (moiety)	42	10	0
	£7,070	19	7
Valuation of live and dead stock	8,298	13	6
	£15,369	13	1

An arrangement has been entered into between the Earl of Warwick and the Corporation of Leamington, under which his Lordship pays the Corporation the sum of 450*l.* per annum for the sewage. This has been equivalent to purchasing 13·6 tons for 1*d.* in the year 1876, 13·9 tons for 1*d.* in 1877, 13·1 tons for 1*d.* in 1878, or an average of 13½ tons for 1*d.* A portion of the sewage has been year by year disposed of to adjoining holders of land; during 1878 to the extent of more than one-third of the whole. From the accounts, it appears that the Earl of Warwick has been a considerable loser by this operation; in 1876 he received 1*d.* for 20 tons; in 1877, 1*d.* for 16 tons, and in 1878, 1*d.* for 54 tons. No doubt in a wet year like that of 1878 it was an advantage to distribute the sewage over as large an area as possible. The works necessary for conveying the sewage to adjoining lands have been executed at the cost of the Earl of Warwick. The preparing of the adjoining lands for the reception of the sewage was done by those of his Lordship's tenants who receive it. During the year 1878 about 45 acres of land were irrigated with sewage by the adjoining land-holders. This area received in that year 521,232 tons of sewage, being at the rate of 11,583 tons per acre, or to an irrigation depth of 114·6 inches.

The sewage of Leamington is first brought by direct gravitation to a site near the river Leam, where there are two sewage-tanks; one a covered tank capable of containing half a million gallons, and the other an open tank capable of holding one million gallons. There are also storm-water outlets from the tanks into the river, so that at any period the excess beyond what may be stored in these tanks passes direct into the river. The average daily quantity of sewage pumped during the past seven years on to the farm has been 823,500 gallons. Alongside the tanks, the pumping-station has been erected for lifting the sewage on to the farm at Heathcote, which is distant about 2¼ miles; it is lifted up to a vertical elevation of 132 feet in order to command the whole of the lands at Heathcote for the purpose of irrigation. The cost of pumping is defrayed by the Corporation of Leamington. At the pumping-station there are a pair of condensing beam-engines, having a stroke of 8 feet, the steam cylinders being 36 inches in diameter. Each engine works a pair of single-acting pumps 26 inches in diameter, which are placed at half distance at each side of the beam. There is but one fly-wheel to the pair of engines, which make from 11 to 12 strokes per minute when in full work. The iron rising-main for conveying the sewage from the pumping station to the farm is 20 inches in diameter for the first half mile, and 18 inches for the remaining 1¾ mile. At the time of our inspection on the 4th of June last, the water-pressure indicated in the engine-house on the rising-main was 65 lbs. to the square inch. The engines are usually employed in raising the sewage on to the farm from 6 A.M. to 4 P.M., and there is a direct telegraphic communication between the sewage pumping-station and the farm, by which all notices referring to the times of pumping and the quantities pumped are transmitted. We understood that the cost of the works undertaken by the Corporation of Leamington for the disposal of the sewage, including the expenditure of 8500*l.* for the tanks, which were originally made for working the A. B. C. process of clarifying sewage, has been 24,000*l.*; and it further costs the Corporation of Leamington from 800*l.* to 900*l.* per annum to pump the sewage on to the farm, against which they have the set-off of the amount paid by the Earl of

Warwick for the sewage. On the sewage farm, at the ends of the delivery-pipes, there are two tanks; the chief tank is a small brick tank which intercepts a small amount of solid matter. At the end of the branch delivery-main there is a large open excavation in the earth for storing sewage; but this is now used only to a very slight extent. As far as possible all the solids of the sewage are pumped with the liquid. For this purpose, the large open tank at the site of the outfall is occasionally stirred up by men who work from a punt, and who mix the solids with the water, so that the whole may be pumped on to the farm. Any solids which cannot be got from the tank at the pumping-station in this way are removed by manual labour about once a year, when the tank is drawn down. This work is done by the Corporation of Leamington, and the solids thus removed are disposed of by them. After the sewage has been delivered upon the farm, in some few cases it is conveyed through earthenware-pipe carriers. Most of the carriers, however, are simple earth-cut trenches, and the sewage is invariably distributed over the surface of the land from such carriers. The land is mostly drained, the stiff land at a depth of 4 feet, with the drains 40 feet apart, and the light land 5 feet deep, with the drains 60 feet apart. There was no surface effluent from the farm, and very little effluent from the land drains at the time of our inspections, compared with the volume of sewage which is applied to the land. The Leamington sewage farm no doubt enjoys some special advantages, all of which have been made the most of. The quality of the sewage is good, and in no other district did we find such facilities for selling the produce from the farm. The prejudice which still exists in many parts of England against milk, rye-grass, and vegetables grown by sewage have here all been overcome, if they ever existed, and in all seasons there are customers for all that is grown. The sewage farm proper, being occupied in conjunction with Lord Warwick's park, is enabled to keep a large head of stock throughout the year; and from the accounts it will be seen that one-half the gross receipts taken on the farm occur in connection with the live-stock or their produce. With reference, however, to the park-land, it should be stated that the rent paid for it and the adjoining arable land is at the rate of 1*l.* 11*s.* 2*d.* per acre, while that of the sewaged land proper is at the rate of 2*l.* 4*s.* per acre. We were also informed that the Earl of Warwick has the privilege of turning his horses in the park without charge, that the arable land held in connection with the park is completely surrounded by game preserves, and that the land is cultivated in a great measure for the purpose of preserving the game; so that it would appear, taking these facts into consideration, that the rent paid for the park land is high. Although the whole of the sewage farm is capable of being irrigated, yet, from the returns which were handed to us, it appears that some parts are cropped with corn and other produce which do not receive sewage, while some of the lighter portions of the land are sewaged every year. The farm was very clean, and in a good state of cultivation. Excellent order was observed everywhere; the hedges, gates, roads, carriers, &c., were all well kept; and, in fact, the arrangements of the farm reflect the greatest credit upon those concerned in its management. Captain Fosbery informed us that the principle of sewage culture which guided him in laying out the Heathcote farm was that sewage farming should not be dealt with as a distinct branch of husbandry, but that, in order to make it successful, it must be ingrafted upon ordinary agriculture.

The following returns, handed to us by Captain Fosbery, show the cropping of the several fields on the sewage farm since it was established, and also the volume of sewage and the number of dressings which have been applied to each field:—

AMOUNT of SEWAGE applied to different FIELDS.

JANUARY 1, 1872—JANUARY 1, 1873.

Number of Field.	Acreage.			CROP.	Number of Dressings.	Total Amount of Sewage.
	A.	R.	P.			Tons.
64	10	1	34	Italian Rye-grass	23	92,439½
25	10	1	17	Italian Rye-grass	26	104,883
20 and 21	6	1	25	Cabbage	6	18,082
22	7	3	6	Market-Garden	2	57,258
44	6	3	17	Mangold	9	22,120¼
65	10	3	11	Italian Rye-grass	27	111,384
54	9	1	29	Fallow for Beans	1	19,232½
67	6	3	16	Permanent Pasture	5	12,515¾
27 and 28	13	3	2	Italian Rye-grass	23	123,832½
50, 41, 45, 63 and 46	41	0	0	Permanent Pasture	3	50,416¼
58 and 59	20	0	15	Fallow for Wheat	2	18,216¼
66	10	2	25	Seeds	7	29,520¾
51 and 53	18	1	14	Mangold	9	66,381¼
48	11	0	36	Italian Rye-grass, after Wheat	4	20,886
13 and 71	20	1	22	Fallow	4	33,202½
47	10	0	32	Seeds	11	45,095½
43	9	0	4	For Grass	4	16,152¼
	Sewage supplied to Farmers				..	87,342¾
	Sewage pumped in Twelve Months ..				..	927,961

AMOUNT of SEWAGE applied to different FIELDS—*continued.*

JANUARY 1, 1873—JANUARY 1, 1874.

Number of Field.	Acreage.			CROP.	Number of Dressings.	Total Amount of Sewage.
	A.	R.	P.			Tons.
24	5	1	12	Cabbage	4	8,857
44 and 47	17	0	9	Seeds	7	51,138½
41, 45, 46, 67 and 26	29	1	31	Permanent Pasture	1	22,225¼
42	8	3	0	Italian Rye-grass	16	52,382¼
58 and 59	20	0	15	Mangold	3	28,779¼
13	12	2	26	Market-Garden	7	35,737¼
Part of 27 and 28	13	0	0	Italian Rye-grass	24	126,518
Part of 27 and 28	0	3	2	Savoys..	23	93,830½
48	11	0	36	Italian Rye-grass	30	161,136
69	9	2	3	Fallow..	1	3,455¼
25	10	1	17	Italian Rye-grass	38	152,317¼
54	9	1	29	Italian Rye-grass	8	30,407¼
43	9	0	4	Italian Rye-grass	35	122,603½
13	12	2	26	Fallow..	4	23,497
65	10	3	11	Stubble	7	27,886½
22	7	3	6	Cabbage	1	2,474½
	Sewage supplied to Farmers			.. ..	..	344,196¾
	Sewage pumped in Twelve Months			..	..	1,291,442

JANUARY 1, 1874—JANUARY 1, 1875.

Number of Field.	Acreage.			CROP.	Number of Dressings.	Total Amount of Sewage.
	A.	R.	P.			Tons.
27 and 28	13	3	2	Cabbage	3	15,642½
64	10	1	34	Fallow	4	17,806¾
Part of 21 and 22	14	0	13	Italian Rye-grass, &c. ..	5	33,098¾
24	5	1	12	Barley Fallow	1	3,965¼
27 and 28	13	3	2	Cabbage Fallow	7	37,047
20 and part of 21	6	0	0	Seeds	22	54,260¾
Part of 43	9	0	4	Italian Rye-grass	27	63,007
25	10	1	17	Italian Rye-grass	29	118,252¾
65 and 66	21	1	36	Mangold	7	63,529
Part of 43	9	0	4	Mangold	33	1,214,383¾
54	9	1	29	Italian Rye-grass	33	119,094¾
64	10	1	34	Parsnips and Carrots ..	1	4,861
41, 45 and 46	19	1	18	Permanent Pasture	2	22,342
48	11	0	36	Italian Rye-grass	23	103,084¾
13	12	2	6	Italian Rye-grass	22	108,205
Part of 20, 21 and 22	4	0	0	Turnips	1	5,584¾
27 and 28	13	3	2	Second Crop of Cabbage..	7	38,289
27 and 28	13	3	2	Italian Rye-grass after Cabbage	5	24,895¼
42	8	3	0	Italian Rye-grass	21	67,297¼
47	10	0	32	Italian Rye-grass	4	17,937
25	10	1	17	Second Crop of Cabbage ..	3	12,294¼
24	5	1	12	Italian Rye-grass	9	18,894½
67	10	0	0	Permanent Pasture	2	18,432
58 and 59	20	0	15	Stubble	1	13,777½
	Sewage supplied to Farmers			.. ..	..	215,536½
	Sewage pumped in Twelve Months			..		1,818,619

AMOUNT of SEWAGE applied to different FIELDS—*continued.*

JANUARY 1, 1875—JANUARY 1, 1876.

Number of Field.	Acreage.			Crop.	Number of Dressings.	Total Amount of Sewage.
	A.	R.	P.			Tons.
Part of 13	8	2	6	Italian Rye-grass	18	58,314
Part of 13	4	0	0	Cabbage	17	32,186
20, 21 and 22	14	0	31	Italian Rye-grass	35	181,322
24	5	1	12	Italian Rye-grass	49	146,676
25	10	1	17	Cabbage	14	35,114
27 and 28	13	3	2	Italian Rye-grass	42	379,010
49, 55 and 56	5	0	0	Mangold	4	7,352
47	10	0	32	Italian Rye-grass	36	166,470
54	9	1	29	Italian Rye-grass	25	98,735
64	8	1	34	Cabbage, Strawberries and Rhubarb	4	15,910
65	10	3	11	Fallow for Mangold	2	9,176
72	9	1	36	Seed	3	13,886
41, 45, 46, 50 and 67	37	0	18	Permanent Pasture	7	66,635
42 and 43	14	0	4	Fallow for Mangold	23	135,515
				Sewage supplied to Farmers		205,629
				Sewage pumped in Twelve Months ..		1,451,930

JANUARY 1, 1876—JANUARY 1, 1877.

Number of Field.	Acreage.			Crop.	Number of Dressings.	Total Amount of Sewage.
	A.	R.	P.			Tons.
23	10	1	19	Italian Rye-grass	31	127,065¾
42	6	3	17	Italian Rye-grass	47	114,054½
27 and 28	13	3	2	Italian Rye-grass	47	246,866
24	5	1	12	Italian Rye-grass	56	112,615½
22	7	3	6	Italian Rye-grass	21	60,232
61	12	1	3	Seeds	22	106,200¾
60	10	1	17	Fallow	20	10,428¾
20 and 21	6	1	25	Fallow	6	17,856½
Part of 13	4	0	0	Fallow	3	6,069
42 and 43	17	3	4	Fallow	2	12,137¾
25	10	1	17	Cabbage	7	29,411¼
41, 45, 46 and 67	26	0	34	Permanent Pasture	8	78,374½
30 and 41	12	0	18	Permanent Pasture	17	84,364¾
64	10	1	34	Mangold, Strawberries and Rhubarb	14	56,324½
54	9	1	29	Bean Fallow	3	11,730¾
20 and 21	6	1	25	Mangold	11	32,902¼
Part of 13	8	2	6	Italian Rye-grass	6	20,529¼
48	11	0	36	Italian Rye-grass after Wheat	7	32,098¾
22	7	3	6	Grass Fallow	9	27,076½
				Sewage supplied to Farmers		**294,069**
				Sewage pumped in Twelve Months ..		**1,480,408**

AMOUNT of SEWAGE applied to different FIELDS—*continued.*

JANUARY 1, 1877—JANUARY 1, 1878.

Number of Field.	Acreage. A.	R.	P.	CROP.	Number of Dressings.	Total Amount of Sewage. Tons.
41, 45, 46, 67 and 44	33	0	0	7 acres Italian Rye-grass and 26 acres Permanent Pasture	29	393,643
42	8	0	0	Italian Rye-grass	26	85,468
23	8	2	0	Italian Rye-grass	27	93,979
13	4	0	0	Italian Rye-grass	36	58,510
22 and Part of 21	8	0	0	Italian Rye-grass	14	45,938
64	10	1	34	Italian Rye-grass, Strawberries and Rhubarb ..	18	72,128
20 and Part of 21	7	0	0	Fallow for Oats..	20	56,378
24	5	0	12	Mangold	15	30,913
Part of 43	4	1	0	Cabbage	5	16,333
Part of 27 and 28	5	2	0	Cabbage	4	9,481
24, Part of 27 and 28	14	1	14	Mangold	13	89,568
29	7	0	0	Mangold	23	58,664
Part of 27 and 28	3	0	0	Turnips	2	3,133
48	11	0	36	Italian Rye-grass	32	143,638
Part of 21	2	0	0	Savoys..	2	2,173
59 and 59	20	0	0	Fallow for Turnips	5	42,000
65	10	0	0	Italian Rye-grass	5	21,000
25	10	1	17	Italian Rye-grass	2	11,268
Part of 43	5	0	4	Parsnips and Cabbage ..	10	45,000
50	10	3	24	Permanent Pasture	4	17,500
54	9	1	29	Fallow for Turnips	4	17,500
				Sewage supplied to Farmers		190,000
				Sewage pumped in Twelve Months ..		1,504,215

JANUARY 1, 1878—JANUARY 1, 1879.

Number of Field.	Acreage. A.	R.	P.	CROP.	Number of Dressings.	Total Amount of Sewage. Tons.
22	6	2	10	Italian Rye-grass	6	15,447½
23	10	1	19	Italian Rye-grass	29	117,739½
25	10	1	17	Italian Rye-grass	31	124,060¾
27 and 28	13	3	2	Mangold	21	113,727½
42	8	3	0	Italian Rye-grass	11	36,117¼
48	11	0	36	Italian Rye-grass	21	94,212¾
44	6	3	17	Cabbage	17	41,253¼
65	10	3	11	Italian Rye-grass	20	80,223¼
13	12	2	26	Cabbage and Italian Rye-grass	11	57,452¼
24	3	1	12	Oat Fallow..	9	11,356¾
20 and 21	6	1	25	Potatoes and Savoys.. ..	6	14,686
41, 45, 46 and 67	26	0	34	Permanent Pasture	7	73,951
54	9	1	29	Mangold	21	77,550¾
51 and 53	19	0	0	Fallow..	2	21,045¾
24	5	1	12	Italian Rye-grass	7	15,691¾
				Sewage supplied to Farmers		521,232
				Sewage pumped in Twelve Months ..		1,415,748

LEAMINGTON SEWAGE FARM.

STATEMENT of ACCOUNTS for the YEAR ending 31st DECEMBER, 1876.

INCOME.	£	s.	d.
Valuation, 31st December, 1876	8,157	0	6
Received for irrigating with Sewage adjoining Lands	60	0	0
Improvements charged to Capital Account	100	0	0
Sale of Wheat	488	18	4
„ Beans	24	14	0
„ Oats..	30	9	0
„ Potatoes	85	6	9
Mangolds and Swedes	90	15	3
Turnips	38	0	0
Grass	813	15	8½
Cabbage	84	0	0
Carrots and Parsnips..	50	0	0
Rhubarb	10	0	0
Hay	661	6	10½
Straw	3	8	0
Provender for Estate Horses, Game, &c.	808	9	0
„ Carriage Horses	316	2	0
Sale of Cattle	1,926	18	0
„ Sheep	522	9	0
„ Pigs	92	17	6
„ Horses	371	0	0
„ Milk..	1,176	19	7
„ Wool	127	0	0
Grass keep	160	12	0
Horse hire to Estate	108	5	0
Royal Agricultural Society for use of Horses, Men's time, and damage to Crops at trial of Implements	173	16	2
Miscellaneous	12	4	6
	£16,494	7	2

EXPENDITURE.	£	s.	d.
Valuation, 31st December, 1875	7,683	14	0
Rent	1,308	12	8
Leamington Corporation for Sewage	450	0	0
Management	200	0	0
Insurance	13	15	0
Cattle	1,414	15	0
Sheep	85	19	6
Horses	155	16	0
Wheat for seed	68	9	4
Barley „	15	0	0
Beans „	48	4	4
Oats „	41	5	0
Potatoes	96	1	2
Grass and other Seeds	123	2	7
Mangold, Swede, and Turnip Seed	24	2	0
Harness	30	2	10
Implements purchased	35	3	9
„ repaired	57	2	1
Blacksmith	40	6	4
Provender	1,121	7	0
Artificial Manure	92	3	10
Wages	1,681	10	3
Rates and Taxes	213	5	3
Railway Bills	9	1	9
Veterinary expenses	75	14	4
Beer for farm Labourers	106	15	3½
Drain-pipes, ashes, &c.	58	4	4
Steam cultivating	8	15	0
Coals	51	7	10
Repairs to Telegraph	1	5	0
Paint	6	5	10
Miscellaneous	68	17	8½
General expenses	30	3	9½
Wages paid for Royal Agricultural Society	36	7	11
Balance profit	1,041	10	5½
	£16,494	7	2

LEAMINGTON SEWAGE FARM.

Statement of Accounts for the Year ending 31st December, 1877.

Income.	£	s.	d.
Valuation, 31st December, 1877	8,366	0	0
Received for irrigating adjoining Land	49	0	0
Capital Account	75	4	2
Sale of Wheat	902	8	4
„ Barley	100	19	0
„ Beans	18	10	0
„ Oats	44	16	0
„ Mangolds and Swedes	89	16	6½
Grass	484	7	5
Cabbage	225	0	0
Rhubarb	10	0	0
Hay	512	6	7½
Provender for Estate Horses, Game, &c.	752	14	6
„ Carriage Horses	370	11	6
Sale of Cattle	2,084	0	0
„ Sheep	647	18	0
„ Pigs	63	15	6
„ Horses	118	0	0
„ Milk	1,352	6	7
„ Wool	146	17	0
Grass keep	66	14	10
Horse hire to Estate	146	6	0
Miscellaneous	30	1	3
Use of Steam-engine	37	10	0
Manure for gardens	18	6	0
	£16,713	9	3

Expenditure.	£	s.	d.
Valuation, 31st December, 1876	8,157	0	6
Rent	1,430	2	8
Leamington Corporation for Sewage	450	0	0
Management	200	0	0
Cattle	1,374	17	0
Sheep	103	1	6
Pigs	3	0	0
Horses	110	17	6
Wheat for Seed	56	10	6
Barley „	22	10	0
Oats „	21	8	6
Potatoes	59	18	10
Grass and other Seeds	126	7	6
Harness	35	18	2
Implements purchased	90	14	9
„ repaired	11	12	3
Blacksmith	40	10	11
Provender	1,431	16	4
Artificial Manure	158	3	6
Wages	1,756	5	3½
Rates and Taxes	157	11	1¼
Railway Bills	9	18	8
Veterinary expenses	33	3	6
Beer for farm Labourers	92	0	6
Drain-pipes, ashes, &c.	16	17	4
Coals	39	4	5
Miscellaneous	129	7	9½
General expenses	25	12	10
Roads	1	14	0
Balance profit	567	3	4¾
	£16,713	9	3

LEAMINGTON SEWAGE FARM.

STATEMENT of ACCOUNTS for the YEAR ending 31st DECEMBER, 1878.

INCOME.	£	s.	d.	EXPENDITURE.	£	s.	d.
Valuation, 31st December, 1878	8,298	13	6	Valuation, 31st December, 1877	8,306	0	0
Received for irrigating adjoining Land	40	0	0	Rent	1,480	2	8
Capital Account, new Shed	180	15	3	Leamington Corporation, for Sewage	450	0	0
" Draining	82	13	0	Management	200	0	0
Sale of Wheat	800	14	2	Insurance	17	9	0
" Barley	131	16	0	Cost of new Shed	180	15	3
" Beans	11	0	0	Cattle	1,458	6	0
" Oats	25	16	6	Sheep	49	12	6
" Mangolds	60	16	0	Horses	30	0	0
" Grass	426	4	11	Wheat for Seed	65	14	0
" Cabbage, Potatoes, &c.	300	0	0	Barley	20	19	0
" Hay	383	14	10	Oats	30	0	0
Grass Keep	43	4	0	Potatoes	39	18	6
Sale of Cattle	2,186	2	6	Grass and other Seeds	123	1	8
" Sheep	673	9	1	Harness	23	1	9
" Pigs	67	0	6	Blacksmith	52	6	3
" Horses	34	0	0	Implements Purchased	23	6	6
Provender for Estate Horses, Game, &c.	625	11	0	" Repaired	144	17	11
" Carriage Horses	261	11	1	Provender	976	0	9½
Sale of Milk	1,541	0	5½	Artificial Manure	82	10	11
" Wool	173	5	11	Wages	1,750	14	4
Horse Hire	177	5	0	Rates and Taxes	172	3	10
Miscellaneous	2	15	0	Railway Bills	8	3	3
				Veterinary Expenses	50	12	10
				Beer for Farm Labourers	84	18	8
				Drain pipes, ashes, &c.	5	17	6
				Coals	46	11	1
				Miscellaneous	117	6	9
				General Expenses	23	5	4
				Repairs to Farm Buildings	1	19	6
				Steam Cultivation	34	2	6
				Balance Profit	417	10	5
	£16,477	8	8½		£16,477	8	8½

It will be seen from the foregoing accounts for the three years ending 31st Dec., 1876, 1877, and 1878 (pp. 39–41), that each year, in addition to paying 450*l.* for the sewage, there has been a profit upon this farm. The profit, however, of 2026*l.* 4*s.* 3¼*d.* in the three years would not pay more than 4·4 per cent. per annum upon the capital which has been invested. The artificial manure charged in the accounts consists of soot for the wheat crop and bones and salt for the permanent grass-land.

The cropping for 1879 was as follows:—

	A.	R.	P.		A.	R.	P.
Italian Rye-grass	49	0	37	Brought forward	201	0	33
Seeds	16	2	23	Cabbage	6	0	0
Pasture	86	2	14	Barley	18	2	0
Potatoes	4	0	0	Parsnips	6	3	17
Oats	18	0	5	Beans	45	2	9
Mangolds	23	3	34	Turnips	23	3	24
Carrots	2	3	0	Wheat	68	2	35
				Rhubarb	0	2	0
Carried forward	201	0	33				
					371	0	38

Rye-grass.—This crop is grown both for sale and home consumption. It is not allowed to stand longer than two years, and about 25 acres are sown every year,—usually in the autumn at the rate of three bushels of seed per acre. A crop sown in September 1877 was cut eight times in 1878 and twice in 1879, and then ploughed up; the land was pressed, sewaged, and sown on the flat broadcast on the 15th June, 1879, with green-top turnips and swedes, which looked well and promising at the time of our visit in August. In 1878 the cutting of rye-grass commenced on the 2nd February. In 1879 it commenced on the 7th April, having been sown in September 1878. The first cutting yielded 4 tons per acre of green grass; the second, on the 4th June, yielded 16 tons of grass per acre; the third cutting on the 8th July, 14 tons of grass per acre; fourth cutting on the 14th August, 8 tons, fifth cutting on the 12th September, 6 tons, sixth cutting on the 6th October, 5 tons, seventh cutting in November, 2 tons per acre. A field of rye-grass was seeded as an experiment with 10 lbs. per acre of trifolium, but it did not answer. Rye-grass is occasionally made into hay, but when this is the case it is carted on to the meadows to finish the drying process. This crop receives enormous dressings of sewage during the period of its growth, as will be seen on reference to the tables showing the quantities of sewage that have been applied to the land.

Mangolds.—This is a crop largely grown on this farm. It is drilled on the flat, the drills being 26 inches distant, and the plants are hoed out to 10 inches' distance in the rows. Sewage is not applied to the crop until the plants begin to bulb. They are then irrigated. This crop in 1878 received 21 dressings of sewage while under cultivation, or 8265 tons of sewage per acre, equivalent to an irrigating depth of 81·8 inches of water in addition to the rainfall. The mangolds of 1878, when examined in the spring of 1879, we found to be sound and good, but not equal in weight and bulk to those grown on the Reading sewage farm. One field of mangolds was poor and stunted, but on the higher and light land they were a capital crop, and in all cases were clean, and the plants regular but late.

Cabbage.—Ordinary cabbages for market are planted on the level in rows 22 inches distant, and the plants are 17 inches apart in the rows. Savoys are planted in a similar manner. Drumhead cabbages are also planted on the flat 26 inches distant in rows and 24 inches from plant to plant. All the cabbages are irrigated during the period of growth, and in 1878 this crop on one field received 17 dressings of sewage, or about 6102 tons per acre, equal to an irrigating depth of 60·4 inches.

Parsnips.—This crop is grown on the level. Six lbs. of seed per acre is drilled in rows 14 inches distant, and hoed out to 6 inches in the rows. The crop is not irrigated, but usually succeeds cabbage or the second year's rye-grass, which has been sewaged. The crop was clean, and promised to be a fair one.

Carrots.—These are drilled in rows on the level at 14 inches' distance, and are hoed out to from 4 inches to 6 inches in the rows. Six lbs. of seed per acre are sown. This crop was not good, nor was it looking well, although it was clean. It is not directly irrigated with sewage, but, like parsnips, succeeds, either directly or after two years, a crop that has been heavily dressed with sewage.

Potatoes.—The varieties grown were "Myatt's Early Rose" and "Victoria." They are planted in drills from 24 inches to 26 inches apart, and 12 inches from plant to plant in the rows. The crop of 1879 was planted on the 9th April, and succeeded rye-grass that had been cut four times the previous year. It was then sewaged, broken up and sown at the end of July, with turnips which were fed off on the ground with sheep. This year the potato crop had been sold at the time of our visit in August at 17*l.* 10*s.* per acre, the buyer having to raise the crop and take all risk. Potatoes are not directly sewaged during the period of their growth, and the crop of 1879 was not so good as usual.

Rhubarb.—At Leamington, as on most sewage farms, this is one of the permanent crops. It costs about 50*l.* per acre to purchase roots, prepare the ground, aud plant out; and the crop realises about 40*l.* per acre every year. The roots, however, require to be taken up every three years, to be divided and replanted; they are planted 30 inches apart, and are irrigated with sewage during the period of growth. After the pulling for market is finished no further use is made of the crop. The purchaser of the crop pulls and markets the produce.

Wheat.—A large acreage of this crop is grown on the farm, but as a rule not under the influence of sewage. Taking the fields of wheat grown during 1879, we found in the first example that the previous crops had been bare fallow in 1878, wheat in 1877, beans in 1876, oats in 1875, wheat in 1874, beans in 1873, wheat in 1872, permanent pasture and mangolds in 1871, and none of these crops were irrigated. The second example was immediately preceded by barley in 1878, turnips in 1877, wheat in 1876, beans in 1875, wheat in 1874, mangolds in 1873, wheat in 1872, and swedes and peas, in 1871. The turnip crop preceding barley was irrigated in 1877. The wheat stubble was irrigated in 1874 and the bastard fallow for wheat in 1872. The third example was immediately preceded by beans in 1878, and before that by grass in 1877, mangold, cabbage, &c., in 1876, parsnips and potatoes and carrots in 1875, parsnips and potatoes in 1874, wheat in 1873, Italian rye-grass in 1872, and Italian rye-grass in 1871. Mangolds were sewaged in 1876, cabbages, &c., in 1875, bastard fallow was sewaged in 1874, and rye-grass in 1872. The wheat crop of the present year was sown at the rate of 2 bushels of seed per acre about the middle of October 1878. The wheat was seeded with 1 peck of rye-grass, 10 lbs. of red clover, 5 lbs. of trefoil and alsike mixed. The plant looked well, especially the "thick set" or square-headed wheat, which promised a good if not a great yield. The Browick wheat was also good.

Oats.—Oats were heavy and lodged. The land was sown on the 22nd of April at the rate of 4 bushels of seed per acre. This crop, like the wheat, is not directly irrigated. This year's crop succeeded Italian rye-grass, which had been grown on the farm the two preceding years, and had been heavily dressed with sewage.

Beans.—The winter beans were drilled on the 23rd October, 1878, and were a poor plant. The spring beans, however, drilled on the 10th March, 1879, were a capital crop. This crop is not directly irrigated with sewage. The seed is drilled in rows at intervals of 15 inches, and 3 bushels per acre are used. The preceding crops vary very much; for example, beans in 1879 were preceded in one case by wheat both in 1878 and 1877, clover in 1876, oats in 1875, mangold in 1874 and 1873, beans in 1872, and oats in 1871. The only sewage applied to these crops was to the mangold in 1874. Another field of beans in 1879 was preceded by wheat in 1878, seeds in 1877, oats in 1876, mangolds and swedes in 1875, oats in 1874, wheat in 1873, beans in 1872, and wheat in 1871. The only sewage applied was to the mangolds in 1875. A third field of beans in 1879 was preceded by Italian rye-grass in 1878 and 1877, wheat in 1876, beans in 1875, grass in 1874 and 1873, wheat in 1872, and swedes in 1871. The crop was irrigated with sewage in 1878, 1877, 1876, 1874, 1873, and in 1872.

Barley.—Barley was a fair standing crop. It was sown at the rate of two bushels per acre on the 22nd of April. The crop is not irrigated directly with sewage. Of two fields of this crop in 1879 one was preceded by turnips and parsnips in 1878; parsnips, cabbage and turnips in 1877; potatoes, carrots, &c., in 1876; mangolds in 1875; Italian rye-grass in 1874 and 1873; barley in 1872; and swedes in 1871. Of the above crops the cabbage in 1877, fallow in 1876, fallow for mangolds in 1875, Italian rye-grass in 1874 and 1873, and fallow for grass in 1872, were irrigated with sewage. A second field of barley in 1879 was preceded by turnips in 1878, barley in 1877, wheat in 1876, clover in 1875, barley in 1874, swedes in 1873, and wheat in 1872. The clover and seeds in 1875 were the only crops previously occupying the ground that were irrigated.

Turnips and Swedes.—Green-top turnips are usually sown broadcast at the rate of 3 lbs. of seed per acre, and are fed off on the ground by sheep. Swedes are also grown on this farm. They are drilled on the flat at 16 inches distant, and the bulbs are hoed out to 9 inches apart in the rows. Two lbs. of seed were drilled per acre. The crop is irrigated with sewage to a moderate extent. Turnips and swedes usually follow a straw crop of either wheat, barley, or oats, and occasionally green-top turnips are cultivated, chiefly after Italian rye-grass.

Seeds are usually sown with the straw crops. The variety and quantity of seed sown has already been given under the head of wheat. Clover is occasionally irrigated in dry seasons with moderate dressings of sewage. By reference to the returns, however, we find that seeds have not been sewaged since the year 1875.

Prickly Comfrey.—This is a crop which has been grown upon this farm for two years, and has been given up, as it was found that the horses and cattle would not eat the produce by choice. It appears, however, that the crop, when once planted, is difficult to eradicate from the ground, as upon the plot on which it had been grown during the present year a number of young plants had made their appearance.

Cattle.—At the time of our inspection 44 Shorthorn cows of good quality were in milk on the farm, and there were also six dry cows. The production of milk is one of the chief features of this farm, and the yield of milk from a cow in summer averages 2¾ gallons per head per day, and all the year round the average is found to be 2½ gallons per head per day. The milk is sold under contract to a milkman at 11*d*. for four quarts all the year round. The cows are milked to within six weeks of calving, and are then turned into the park, but when not in calf are sold to the butcher. It has been found by experiment that in summer, when the cows are fed on rye-grass, a cow consumes and wastes 1½ cwt. of grass per day. The cows which are not bred on the farm are bought in with the second or third calf, and are kept in good condition ready for the butcher. The cows, when in the sheds in the early part of the present year, and at other times, were found to be kept remarkably clean, and were regularly groomed, and the attention given to them was well requited, as they looked well and healthy. Under the terms of the contract with the milkman the bailiff is always bound to supply him with any quantity of milk he may give notice that he requires, and consequently it is often necessary to buy cows to give the extra supply. Barren cows are sold fat, and others are bought in their place to keep up the supply of milk. The cows in summer are fed on rye-grass, and 3 to 4 lbs. each of undecorticated cotton-cake mixed with bean-flour and palm-nut meal. At night they have a run in a meadow. In winter they have about 6 lbs. each per day of decorticated cotton-cake mixed with bean-flour, pulped roots, and hay. There were 27 rearing calves on the farm. They are fed for the first week on new milk, and afterwards on skim-milk with a little oilcake. They are kept in yards until 12 months old, and are then turned into the park and fed off at two or two and a half years old. The heifers not required for the herd are finished off in the park, and the bullocks are brought up to folds, and have cake, corn, and roots. There were 54 rising three-year-old steers, 22 heifers two years old, and 44 yearlings on the farm. There is also one pedigree bull, "Duke of Sockburn 2nd," 36,544, by "Cherry Duke 2nd," 25,758. The way in which so many calves are reared is that during the summer the cows give more milk, and the milkman takes less, as the winter is the Leamington "season."

Sheep.—There were 150 ewes, 172 one-year-old tegs, 222 lambs, and 2 rams on the farm. The sheep are bred from Shropshire ewes crossed with an Oxford Down ram, and are a very good lot. No sheep are bought, but about 160 ewes are every year put to the ram, and the produce reared and mostly sold fat as yearlings. When the lambs are weaned they have an allowance of oats and Indian corn mixed, at the rate of ¼ lb. per head per day. The tegs on the pastures were having 1 lb. per head per day of decorticated cotton-cake and Indian corn mixed together. They would then be put on green-top-turnips, afterwards on swedes with clover-hay, and corn. Fifty tegs had been sold previous to June at 60*s.* each bare shorn, and some of the lambs had also been disposed of.

Horses.—There were 26 horses and young stock on the farm, or 13 cart-horses, 3 mares in foal, 4 three-year-olds, 2 two-year-olds, 3 yearlings, and one nag. The horses not only do the work of the farm, but are also required for the working of the estate. They are a very useful stamp of horse, of Clydesdale and Suffolk breed. It is found that the horses on this farm are not subject to grease or any other disease.

Pigs.—Three breeding sows and one boar of the small white breed are kept. The young pigs are mostly fattened and sold as porkers of about 80 lbs. weight.

Farm Buildings.—These consist mainly of the old buildings on the farm previous to its adaptation as a sewage farm; but they have been added to and made fit for the reception of the milking and other stock. Very great judgment has been exercised in the alteration of the old buildings, which have been well arranged so as to meet the present requirements of the farm without any extravagant expenditure, and they are kept in excellent order and condition.

Sanitary.—Twenty-six persons reside on the sewage farm, including fourteen children, and twenty others are employed who do not reside on it. At no time has there been any form of epidemic disease. A child about twelve months old died about six years ago, and one man not living on the farm died from inflammation of the lungs. Dr. Wilson, the medical officer of health of the district, reported August 6th, 1879, writing to Captain Fosbery, the agent of the Earl of Warwick, "Concerning the sanitary condition of the Heathcote sewage farm and its surroundings, I have much pleasure in being able to state that I have never received any complaint of nuisance connected with the farm, nor have I, though I have frequently inspected it myself, ever detected any. The roads through and around the farm are much frequented as carriage-drives by residents in Leamington, and I need hardly say that if there were any offensive effluvia given off from the farm I should not only hear of any complaints which would certainly be preferred, but the roads themselves would soon be deserted by pleasure seekers. I have further to state that during the six years I have held my present appointment no case of fever or illness of any kind has come to my knowledge which could be in any way attributed to the farm or to the dairy produce. Indeed, the health of those on the farm, and of the residents in the neighbourhood, has, so far as I have been able to ascertain, been exceptionally good; and it is within my knowledge that both butter and milk were repeatedly analysed by the former analyst of Leamington, and found to be of excellent quality."

CLASS 2.—DONCASTER SEWAGE FARM.

THIS farm is the freehold property of the Corporation of Doncaster and of Lord Auckland, 26 acres being the property of the last-named owner. It was partially laid out by the Corporation of Doncaster, and has since been completed by the tenant. The farm has been let on lease for fourteen years to Richard S. Brundell, Esq., and the lease will expire on the 2nd of February, 1887. The farm contains an area of 304 a. 3 r. 11 p., of which 229 a. 1 r. 27 p. were irrigated in 1878, 75 a. 1 r. 24 p. not being irrigated; it was established in 1873, and receives the sewage of the town of Doncaster, which contains a population of 21,000 persons.

The sewage of Doncaster is collected at a low point in the town near the river Don, where the pumping station is placed, and whence the sewage is pumped through a 21-inch cast-iron main about two miles in length on to the farm, at a cost to the Corporation of Doncaster of about 350*l.* per annum. The cost of the pumping station and of the delivery main to the farm has been 18,000*l.* At the pumping station there is an overflow from the sewers into the river, through which the sewage is discharged in times of storm or other periods when the sewers are surcharged. At the pumping station there are a pair of compound beam engines with wrought-iron beams working two pumps direct from the beam. The whole of the sewage pumped on to the farm has to be lifted to an elevation of 52 feet. The delivery of the sewage on to the farm, however, only takes place in the daytime. At night it is stored in a tank-sewer capable of holding 250,000 gallons of sewage, which is placed in the lower part of Doncaster. At the sewage works there are fixed in the sewers cages which form screens to keep out the larger solid matters from the pumps, all the rest of the sewage being pumped on to the farm. At the highest level of the sewage farm there has been constructed a triangular sewage tank one acre in extent, for the purpose of the storage of sewage; but experience has shown that it is undesirable to use this tank. When the sewage arrives on the farm, it is distributed through earthenware pipe carriers, laid either in embankments or immediately below the ground. These carriers occupy all the high portions of the farm, whence the sewage is distributed over the land in earth-cut carriers. The earthenware carriers vary in size from 18 inches to 9 inches in diameter, and in some cases they are worked under slight pressure. The farm is situated upon the Pebble or Conglomerate Beds of the Bunter series of the New Red Sandstone formation, and the soil is of a somewhat variable character. The larger portion of the farm is very light land resting upon a subsoil of red sand, the remaining portion consisting of red stratified clay. Experiments showed that, on an average of three samples of light soil, the quantity of water capable of being absorbed was 23·8 per cent. of its weight; a sample taken from a field of mangolds, of a rather loamy nature, on an average of three experiments, absorbed 28·8 per cent. of its weight of water, and the stiff soil on the farm on an average of three samples, absorbed 47·4 per cent. of its weight of water. These experiments show that the light land is of an extremely porous character; and this is abundantly testified by the quantity of sewage which the land is capable of absorbing, and which will be hereafter referred to. About 90 acres of the farm have been under-drained. In the porous soils the drains are 6 feet deep, on the loamy soils 4 feet 6 inches deep, and in the clay lands they are 4 feet deep. The drains vary in distance from 11 yards to 40 yards apart. Notwithstanding the large quantities of sewage which were poured upon the surface at all periods of our inspection, it was found that there was no surface effluent, and that the under-drains also yielded little or no effluent water.

The amount of capital expended in preparing the land as a sewage farm has been as follows:—

	£	*s.*	*d.*
Cost of preparing Land—Corporation of Doncaster paid for Materials and Laying-out	3500	0	0
Tenant for Labour, Laying-out part of Farm as agreed..	300	0	0
Corporation of Doncaster for extra Buildings	1000	0	0
Extra Buildings, Cost to Tenant	350	0	0
	£5150	0	0

In addition to the cost of laying-out the land, it has cost the Corporation of Doncaster 18,000*l.* for the erection of the pumping station and the delivery main for conveying the sewage to the farm. The sum of 4000*l.* capital has been embarked by the tenant in the working of this farm, part of which was paid as a valuation on entering, viz., 971*l.* 17*s.* 2*d.*, to which must be added tenant's improvements 295*l.* 9*s.* 4*d.*, making a total sum of 1267*l.* 6*s.* 6*d.* as the present estimated amount of the tenant-right valuation.

Five acres of land have been specially prepared as a filter bed, having been more closely drained; but experience has shown that it is not necessary for this land to be used for the purpose intended; and it is now worked like other portions of the farm. The sewage is applied to various crops in the spring and summer, and also to a few crops in the winter; but it is largely applied to fallow land in the winter-time. This farm forms an excellent example of careful, judicious, and economical working. With capital little in excess of that required for an ordinary farm, the land is well tilled, fairly cleaned, and a large quantity of produce is raised from a naturally poor soil. The labour bill is small, yet everything is in decent order.

The statements on pages 50 and 51 give the last two years' balance-sheets of the working of this farm.

The cropping of the farm for the year 1879 was as follows:—

	A.	R.	P.
Black Currants	1	2	0
Gooseberries and Raspberries	1	2	0
Peas	4	2	0
Mangolds	31	0	0
Wheat	27	0	0
Barley	47	2	0
Oats	7	2	0
Rye	2	2	0
Beans	5	2	0
Carried forward ..	128	2	0
Brought forward ..	128	2	0
Potatoes	2	0	0
Turnips and Swedes ..	34	0	0
Fallow	12	0	0
Clover Seeds and Rye-grass	75	0	0
Meadow	46	0	0
Oziers	3	0	0
Roads, Carriers, Buildings, Tank and Stackyard ..	4	2	0
	305	0	0

The rent now paid for the land and sewage is 3*l.* per acre, but the land before it was converted into a sewage farm was let at an average of 26*s.* per acre; and the ordinary rent paid for adjoining agricultural land is at the present time about 30*s.* per acre.

The following quantities of sewage were pumped on to the farm in the years 1874–78:—

1874—968,781¼ tons.
1875—891,808¾ „
1876—981,177½ „
1877—895,384 tons.
1878—921,440¼ „

The volume of sewage applied to various crops differs enormously; as much as 17,505 tons per acre were applied in 1878 to rye-grass, which was equivalent to a vertical irrigation depth of 173 inches in the year. Mangolds received 6455 tons or 64 inches in vertical depth, and permanent grass 4504 tons per acre or 44 inches in depth; while beans received only 188 tons per acre or 1¾ inch in depth.

DONCASTER SEWAGE FARM.

Statement of Accounts for the Year ending 2nd February, 1878.

Income.	£	s.	d.	£	s.	d.	Expenditure.	£	s.	d.
Valuation, February, 1878, as follows:—	£	s.	d.				Valuation, February, 1877	4,996	8	2
Implements	1,033	15	0				Wages	702	13	4
Buildings	149	7	0				Rent	863	12	0
Live Stock	1,417	0	0				Rates, Taxes, &c.	105	5	5
Corn, Hay, Roots, &c.	1,400	0	0				Rent Owing	448	6	6
Tenant's Right, Growing Crops, &c.	1,267	6	6				Oilcake, &c.	50	17	4
				5,267	8	6	Seed, &c.	77	4	2
Sale of Corn				673	11	7	Purchase of Stock	504	4	3
,, Live Stock				833	11	3	Tradesmen's Bills	159	10	6
,, Roots and Green Crops				1,061	5	2	Tenant Right on Hay's Close	67	6	6
,, Sundry Crops				203	8	11	Draining and Levelling Land	48	16	0
Last Half-year's Rent paid				401	18	7	Management	100	0	0
							Balance Profit	316	19	10
				£8,441	4	0		£8,441	4	0

DONCASTER SEWAGE FARM.

STATEMENT of ACCOUNTS for the YEAR ending 2nd FEBRUARY, 1879.

INCOME.		£ s. d.	EXPENDITURE.	£ s. d.
Valuation, February, 1879, as follows:—	£ s. d.		Valuation, February, 1878	5,267 8 6
Implements	971 14 6		Wages	721 12 3
Buildings	140 7 10		Rent	904 0 0
Live Stock	1,665 0 0		Rates and Taxes paid	48 6 11
Corn, Hay, Roots, &c.	948 0 0		Rent Owing	437 19 5
Tenant Right, Growing Crops, &c.	1,267 6 6		Oilcake, &c.	42 12 3
		4,992 8 10	Seed, &c.	127 13 4
Sale of Corn		1,049 8 8	Purchase of Stock	769 4 4
,, Live Stock		947 11 2	Tradesmen's Bills	192 10 10
,, Roots and Green Crops		767 7 4	Management	100 0 0
Sundry Sales		152 4 6	Levelling Land	11 1 0
Rent paid due previous Year		448 6 6		
Balance Loss		265 1 10		
		£8,622 8 10		£8,622 8 10

Rye-grass.—There is a very uncertain demand for this crop, which compels the tenant to manage the land more as an ordinary farm than as a sewage farm. About one-fourteenth part of the farm was under cultivation with rye-grass in the year 1879. It is grown from seed sown in the spring with a corn crop, at the rate of 2 bushels per acre; it is allowed to stand for cutting for two years, and is then grazed for another year. The crop on the light soil of this farm will take enormous quantities of sewage, and in the year 1878 as much as 247,263¾ tons were applied to a field of 14 a. 0 r. 20 p., being at the rate of 17,505 tons to an acre, or to a depth of 14 feet 5 inches. This crop was cut for the first time in the year 1879 in the first week in May, and was sold at the rate of 9*d.* per cwt., the yield of this cutting being from 10 to 12 tons per acre. The crop would probably be cut four times in that year.

Mangolds.—The soil of this farm is not suited for the growth of mangolds; and without sewage they could not be grown on the light land. They are a poor plant on the light land; on the more loamy soils they are better and more regular. Six pounds of seed are drilled per acre on ridges 27 inches distant, and the plants are about 12 inches apart on the ridge. The crop is usually sold by auction on the land at the end of October, and realises from 18*l.* to 25*l.* per acre. Mangolds are irrigated with sewage during the period of growth.

Swedes.—This crop was the best we saw on any sewage farm we examined, and promised to be a heavy crop. Two pounds of seed per acre were drilled on the flat 21 inches distant; and the plants were 10 inches apart in the drills. We ascertained that the hand-hoeing cost 8*s.* per acre, viz. 5*s.* per acre for chopping out and singling, and 3*s.* for hoeing a second time. A man ordinarily earning 17*s.* per week can make more money at the above prices. The crop was by no means free from couch grass. The swedes followed rye-grass that had been down for three years, the last crop of rye-grass having been fed off on the ground with sheep. The swedes are sold by auction in October, and realise from 10*l.* to 18*l.* per acre. The crop is occasionally irrigated with sewage.

White Turnips.—This crop succeeds rye, which is fed off on the land with sheep. When we visited the farm on the 5th of June, 1879, the crop of rye was on the land. On our visit on the 13th of August, the turnips were covering the ground, and had made a wonderful growth in a very short time. There is a good demand for this crop; and what is not fed off by sheep is sold to cow-keepers at 18*s.* per ton. This crop had not been directly irrigated with sewage. Two pounds of seed per acre are sown.

Wheat (Scotch Brown) was a very heavy crop, and in some places lodged. Some of the ears appeared to be deficient owing to the wet weather. Ten pecks of seed per acre were drilled. The cereals on this farm contrasted in a most marked and favourable manner with those on adjoining lands which had not been sewaged. Wheat is not irrigated with sewage during the period of its growth.

Barley.—Twelve pecks per acre of seed are drilled for this crop after wheat, and it looked very well. The land had not been sewaged for this crop. Some barley on light sandy land which had been previously sewaged also looked very well. Barley is not directly irrigated with sewage.

Rye.—Eight pecks per acre of seed are drilled for this crop on a field of light land adjoining a covert, and it had been sewaged to get it out of reach of the ground game. Clover and other grass seeds had been planted in the rye, having been sown 4 inches apart with a seed barrel on an ordinary corn drill. The crop looked very well.

Oats.—Potato oats are also grown on this farm, but the crop is not sewaged during the period of its growth. Sixteen pecks of seed per acre are drilled.

Peas.—Peas were a fair crop for the season. The land is prepared for the peas and let to a customer who finds the seed and pays for hoeing, picking, &c., and 7*l.* 10*s.* 0*d.* per acre for the land. The crop is generally ready for market at the end of June or the beginning of July; but in 1879 it was a month later than usual. The crop is not sewaged during the period of its growth.

Beans (Spring) are also cultivated on this farm. They were a fair crop, but are not sewaged while growing. Eight pecks of seed per acre are drilled.

Potatoes.—The varieties grown are "Victoria" and "Champions." They are planted on ridges 27 inches distant and about 12 inches apart in the rows; only a small quantity are grown, and there was a tendency to run to haulm. This crop is not irrigated during the period of its growth.

Oziers (Long Skin Hards) are grown on the low-lying and flat land on the east side of the farm. They are planted in rows 27 inches apart; the sets being 12 inches distant in the rows.

Market-Garden.—Three acres of land have been laid out as a market-garden and planted with gooseberries, currants of various kinds, raspberries, and strawberries. Intermediate between the fruit bushes, various kinds of market-garden produce are grown, such as carrots, parsnips, broccoli, cabbage, potatoes, and celery. This part of the farm is sublet to a tenant with a cottage at 40*l.* per annum. The tenant has the right to have what sewage he requires. There was an enormous crop of weeds on the ground amongst the vegetables and bushes; but this is due to the fault of the sub-tenant. It originally cost 38*l.* to plant the land with currant-trees, gooseberries, &c.

Mixed Seeds.—A field of seeds grown on very poor land had been irrigated; then the carriers had been ploughed in to prevent sheep being cast in them, and these will be opened out when sewage is again applied. This field is grazed with sheep and cattle; and it is intended to retain it in grass as long as it will produce any feed.

Grass-land.—With some exception the grass-land is irrigated once or twice in the winter, and produces a great amount of summer food, on which the cows milk remarkably well. Young stock also thrive on this pasture, which carries double the stock of ordinary grass-lands.

Rotation of Cropping.—On the light lands on this farm the following rotation is observed: roots, barley, rye-grass for three years, and then a return to roots. On the loamy soils, roots, wheat, seeds, wheat, and then a return to roots; and on the stiff lands, wheat, clover, wheat, beans, and fallow.

Cattle.—Twelve milking cows (Shorthorns) and a bull are kept on this farm. More would be kept, but there is no demand for milk. There appears to be a foolish prejudice against the use of milk from a sewage farm in this neighbourhood. A small quantity is sold at 10*d.* per four quarts. At the farm, the tenant says he would be glad to sell at 8*d.* per four quarts if he could dispose of a quantity. It is a great drawback to a sewage farm not to be able to sell the rye-grass grown nor to turn it into milk in consequence of the want of demand. No effort is made by the farmer to increase the yield of milk by artificial feeding on account of there being no demand. The cows yield about 1½ gallon of milk per head per day, and are kept in the summer in the pastures, with a little rye-grass when in the shed for milking. In the winter they are fed on roots and hay.

All calves are reared on the farm and are fed principally on skimmed milk. There were thirty-one heifers and steers grazing on the farm last year (1879). In the winter they are brought into the straw-yard and fed on hay and roots. The bull is a Shorthorn and was bred on the farm. Barren cows are fatted on cake and roots. Heifers are fed as before described and kept as cows. Steers are fed on roots, cake, and hay, and sold for beef.

Sheep.—A flock of 150 breeding ewes are kept on the farm, 120 Lincolns and 30 Hampshire Downs, all of which are bought in. They produce on an average 200 lambs, which are sold off fat at prices varying from 38*s.* to 46*s.* each. The flock was not free from foot-rot at the period of our inspection. Both the ewes and lambs are sold fat and are fed upon turnips, mangolds, and seeds.

Pigs.—Fourteen pigs, including two breeding sows, are kept on the farm; and are fed on the skim-milk, meal, and vegetable waste.

Horses.—There are thirteen excellent horses and foals on the farm, two Suffolk and six Yorkshire bred cart-horses are employed to work the farm. There is also a nag, two two-year-olds, and one mare and foal. The horses are reported to be free from grease or any other disease, and to thrive wonderfully well on the sewaged rye-grass.

Sanitary.—Forty-four persons reside on the farm, twenty-two of whom are children; and six persons work on the farm who do not reside on it.

Mr. R. S. Brundell, the lessee, reports that there has been no form of epidemic disease amongst the men or their families, and no deaths have occurred on the farm; and that the "health generally is good on the farm and in the neighbourhood."

CLASS 2.—BIRMINGHAM SEWAGE FARM.

AT Birmingham the sewage farm is worked by the united district called the Birmingham, Tame, and Rea District Drainage Board. Mr. James Anscombe has the management both of the sewage farm and the general treatment of the sewage at the sewage works.

The sewage farm has been twelve years in operation, and contains an area of 271 a. 2 r. 18 p., of which 169 a. 2r. 19 p. are the freehold property of the Drainage Board, and 101 a. 3r. 39 p. are held upon lease by the same Board.

The population of the united district is 450,000, and the volume of sewage to be dealt with at the site of the outfall works is about 12,000,000 gallons per day in dry weather. One-fourth, or 3,000,000 gallons per day only, are applied to the land, on to which it flows by direct gravitation ; the remaining three-fourths, after chemical treatment, are passed into the water-courses of the district. At 6 P.M. on the 4th of June last, 10½ inches in depth of sewage was flowing over a gauge-dam, 4 feet wide, on to the sewage farm, this being at the rate of 6,305,400 gallons in 24 hours. Again, at 3.30 P.M. on the 11th of August, 10 inches in depth of sewage was flowing over the same dam on to the sewage farm, being at the rate of 5,860,400 gallons in 24 hours.

With reference to the preparation of the sewage prior to its application to the land, it should be stated that one portion of the land, 30 acres in extent, receives the sewage without any treatment; 20 acres receive the sewage after it has had lime added to it, but before precipitation in the tanks; and the remaining portion receives the sewage after subsidence has taken place in the tanks. It is the clarified effluent from the tanks which is used for irrigation. The manager considers that, of the two sewaged areas, the one receiving crude sewage and the other limed sewage, the one in which the sewage has had lime mixed with it answers the best. The mode of treatment of the sewage is as follows:—At about a quarter of a mile distant from the site of the outfall into a series of tanks, lime is added to the sewage as it flows through the sewers. This lime is procured from Dudley, in Staffordshire, and is ground in water, in an arrangement similar to that of a mortar-mill, and the slaked lime flows from the mill direct into the sewer. About 14 tons of lime are every day added to the sewage as it flows down the outfall sewers. The subsidence-works at the outfall of the sewers consist of 19 tanks, or 3 large roughing-tanks, into which the sewage first flows, which average 390 feet in length, 90 feet wide and 5 feet 6 inches deep (one of these roughing-tanks having not yet been used); and there are 16 smaller tanks, each 150 feet long, 50 feet wide and 8 feet deep. Each of the large roughing-tanks now in use is at present worked for about a fortnight, after which period the sewage is diverted into the other while the deposit is removed from the former; but it is intended, as soon as the third roughing-tank is brought into operation, to empty these tanks weekly, and so relieve the work which has to be done by the smaller subsidence-tanks. The flow of the sewage is so regulated that each of the secondary subsidence-tanks receives about $\frac{1}{16}$th part of the sewage, and in them subsidence takes place. At each end of these subsidence-tanks, the floors of which slope to both ends, are placed the suction-pipes attached to a Tangye's special pump fixed in a temporary shed in a convenient position with reference to the tanks. This pump lifts the semi-fluid deposit from the tanks into a series of elevated wooden troughs, which are fixed upon poles at a considerable altitude at the site of the works, but having a good fall to the ground to which it is desired to convey the liquid sludge. In these troughs the sludge flows, or it is assisted by men who walk in them, and who are provided with poles to which is fitted a disc, with which they push the sludge forward as they move down the trough. The bulk of the deposit from the roughing-tanks is lifted by a "Jacob's ladder," worked by steam-power, and the matter is conveyed into the elevated troughs for conveyance on to the land; the remainder, which largely consists of road-drift from the streets and roads, is removed by means of a steam-crane. The sewage farm, therefore, is not only required to deal with the liquid sewage, but is also used for the disposal of the sewage-sludge. The whole farm up to the present time has received one dressing of sludge, and some portions are now receiving a second dressing. About 500 tons of moist sludge are raised every day and passed on to the land, and fifty-four acres of land are required every year for its reception. The land is prepared for this purpose by raising small embankments so as to divide it into a series of small tanks into which the sludge is run in succession, and, after it has consolidated, in the course of a few weeks it is dug into the land to a depth of 2 feet. When ready to dig into the land, it forms a deposit of about 12 inches in depth. Experiments made by us show that the liquid sludge as conveyed by the troughs to the land in August contained 415·8 per cent. of water when compared with the dry matter present in it, or each 100 parts of the sludge contained 80·62 of water and 19·38 of dry matter; and when ready to dig into the land the moisture had so far diminished that it was found to contain but 91·4 per cent. of water, or each 100 parts of the sludge contained 47·65 of water and 52·35 of dry matter. Three other samples of the Birmingham sewage-sludge sent to us in November were found to contain as follows:—

First Sample from the roughing-tanks contained 617 per cent. of its weight of water when compared with the dry solid matter in the sample.

Second Sample of sludge from the ordinary subsidence-tanks contained 677 per cent. of water, and

Third Sample of sludge from the land before it is dug in was found to contain 177 per cent. of water, when similarly compared with that in the dry solid matter in the sample.

Two samples of sewage-sludge taken on the 29th of September, 1879, and analysed and valued by Dr. W. Wallace, the City analyst of Glasgow, had the following composition and value:—

ANALYSIS of BIRMINGHAM SEWAGE-SLUDGE, 29th September, 1879 (AIR DRIED). By WILLIAM WALLACE, PH.D., &c., GLASGOW.

	Sludge from Roughing Tank.	Sludge as dug into the Land.
Water	12·70	13·16
Organic matter	19·19	20·04
Phosphoric acid	·40	·72
Sulphuric acid	1·45	·35
Carbonic acid	7·62	8·53
Lime	11·19	12·74
Magnesia	·90	1·37
Oxide of iron	2·70	3·20
Alumina	2·68	2·58
Sand, clay, &c.	41·13	37·93
	99·96	100·62
Phosphate of lime	·87	1·57
Nitrogen	·52	·49
Equal to ammonia	·63	·60
Calculated value per ton	10*s*. 9*d*.	11*s*. 5*d*.

The operations of preparing the land and digging in the sludge cost 12*l*. per acre. This amount is not charged to the farm, as the sludge is not considered delivered to it until this operation has been completed. The land after it has received this sludge is turned up every two years with a steam plough. Experience shows that the sludge does not amalgamate with the soil; and what strikes one is its utter worthlessness; for even with the addition of lime, after the lapse of this period, it still exists as a mass of fibrous matter in the ground.

The soil of the farm is sandy, and contains peat upon a gravel subsoil. The character of the soil is shown by experiments which have been made with reference to its absorption of water. The lighter portions, which contain peat, are shown to absorb 78·8 per cent. of their weight in water, while a more loamy sample absorbed but 56·01 per cent. of its weight in water. The admixture of the sewage sludge has somewhat altered the natural character of the soil and increased its absorbent property for water.

The farm, lying as it does between two small rivers—the Tame and the Rea—is liable to be flooded. Although the land has been embanked, yet a part of the farm was under water a few days before we made our inspection in August last. About 197 acres of the land is very closely under-drained, the drains being half a chain apart and 6 feet deep. In some parts of the farm, however, the drains are a chain apart. The outfalls of the under-drains are constructed so as to enable one to examine the effluent, which at the time of our inspection had the appearance of spring-water, and did not in the least tend to foul the open watercourse which flows through the land, and into which the under-drains discharge. The sewage is distributed by surface-carriers, which are all cut in the earth, no expensive masonry or pipe-carriers being used.

The capital expended in fitting this farm for the reception of sewage has amounted to 13,709*l.* 11*s.* 7*d.*, which sum includes the expenditure necessary for embanking the river. The items are made up as follows:—

	£	*s.*	*d.*
Levelling and draining land, forming roads, bridges and carriers	9,844	7	0
Embanking river	807	15	1
Farm buildings and cottages	3,057	9	6
	£13,709	11	7

An examination of the accounts for 1878 shows that the income and expenditure have been as shown in the table opposite (p. 59).

It should be observed in reference to the above accounts that no rent is charged against the farm for the freehold land. On the other hand, no abatement is made for 54 acres of land which are every year taken out of the farm for the purpose of dealing with the sludge. It will also be observed that the amount of rent charged is quite as much as the whole of such land would be worth to an ordinary farmer, especially having regard to the fact that it is liable to be flooded, as has been the case during the present year. The two adjoining farms, we have been informed, are let at 2*l.* and 3*l.* 5*s.* respectively per acre.

The following table gives the cropping for the year 1879:—

	A.	R.	P.		A.	R.	P.
Potatoes	10	2	0	Brought forward ..	155	3	4
Swedes	7	2	0	Oats	15	0	0
Kohl rabi	8	2	0	Wheat	9	0	0
Rye-grass	68	0	0	Grass-land	26	0	0
Mangold	25	0	0	Barley	3	0	0
Turnips	13	1	4	Land used for sludge ..	17	2	0
Peas	4	0	0	Works (including ¾ acre rhubarb)	19	1	31
Cabbage	12	0	0	Roads and stream	25	3	23
Seeds	7	0	0				
Carried forward ..	155	3	4		271	2	18

BIRMINGHAM SEWAGE FARM.

STATEMENT of ACCOUNTS for the YEAR ending 31st DECEMBER, 1878.

INCOME.	£	s.	d.	EXPENDITURE.	£	s.	d.
Valuation Stock in hand, 31st December, 1878	4438	13	9	Valuation Stock in hand, 31st December, 1877.. ..	2883	7	0
Sale of Milk	1270	16	7	Wages	750	0	0
„ Stock	842	14	10	Manager	100	0	0
„ Rye-grass	790	3	10	Seeds, Plants, &c.	251	10	6
„ Vegetables	549	15	0	Horse and Cattle keep	650	17	2
Mangolds and Swedes	165	18	8	Engine and Ploughing tackle	840	0	0
Hay	173	4	0	Tools and Repairs	124	13	10
Sundries (Vetches, &c.)	98	7	3	Rent*	337	10	0
				Rates and Taxes	245	19	4
				Stock purchased	1080	17	6
				Balance-profit	1064	18	7
	£8329	13	11		£8329	13	11

* No rent is charged for the freehold land.

Rye-grass.—The rye-grass is sown in the spring, and is not allowed to stand more than two years. There was no great demand for grass this year (1879) nor last year, hence much of it was made into hay. This crop receives a large amount of sewage during the period of its growth. Three bushels of seed per acre are sown.

Potatoes..—" Early Rose" and Patterson's " Victoria " are the sorts grown. They are planted in ridges 24 inches apart, and 10 inches distant on the ridge. No sewage is given to this crop during the period of its growth. The land on which the potatoes were growing had been twice dressed with sewage-sludge.

Mangolds.—The mangolds are drilled in ridges 27 inches apart, and hoed 12 inches distant from each other on the ridges, 6 lbs. of seed being drilled to the acre. Last year the average yield of this crop was 63 tons per acre. Various varieties are grown. The crop, as a rule, after the plants are sufficiently strong, is irrigated fortnightly, but last year, owing to exceptionally wet weather, only one dressing of sewage had been given prior to our last visit on the 11th of August, 1879. We have, however, been informed by the manager that subsequently four additional dressings were applied before the crop was got up. The mangolds this year have been under water from the flooding of the river, but the crop does not appear to have been much injured. No manure but the sewage and sewage-sludge is used for growing the crop.

Kohl Rabi.—This is a crop that has been very successfully grown on this farm. It is drilled in ridges the same as mangolds, but 3 lbs. of seed per acre are sown, and the crop is only watered with sewage in dry weather. A part of the crop of 1878 was clamped, and when examined in the spring of 1879 was found to be both weighty and sound, and the crop of 1879 promised equally well.

Cabbage.—These are grown on the flat, and are planted in rows 24 inches apart, and the plants are 18 inches distant in the rows. This crop is irrigated with sewage from time to time. The price at which the cabbages are sold varies from 11*d.* to 13*d.* per dozen, and the crop realises about 40*l.* per acre.

Wheat.—The variety grown is Browick Red. It is a good crop, but late. It is drilled 7 inches apart, and 2 bushels of seed per acre are sown. The crop is not irrigated during the period of growth.

Barley.—This crop does not promise so well as the other cereal crops. It is not irrigated with sewage during the period of growth. It is drilled 6 inches distant, and 2½ bushels per acre of seed are sown.

Oats.—This is a heavy crop, but is much laid. Very heavy crops of oats have been grown on this farm. In 1878, 11 acres of Black Tartar oats yielded 120 bushels of corn, and 2 tons of straw per acre. This crop is drilled 6 inches apart, 3 bushels of seed per acre being sown; it is not sewaged during the period of its growth.

Swedes.—These have been successfully grown on this farm, but in 1879 they were evidently too late to produce a great weight per acre. The crop is grown on ridges 24 inches apart, the roots being 9 inches distant on the ridge.

Early Turnips.—This crop is sown on the level, 3 lbs. of seed per acre being used. In June (1879) it promised to be a good crop, but when examined in August it was all spoilt, having run to seed, as many other early-sown root-crops did that year.

Vetches.—Both spring and winter vetches are grown on this farm, but the crop did not look well. Three bushels of seed per acre are sown. The crop is not irrigated during the period of its growth.

Peas.—This crop is sown on the flat. Two bushels of seed per acre are drilled in rows 18 inches apart, and close together in the rows. It is not directly irrigated with sewage.

Rhubarb.—The quantity cultivated is three-quarters of an acre. The sort grown is the "Victoria," a late variety. Up to June of this year about 30*l.* had been realised for the crop. The roots are planted about 4 feet apart, and every three years they are taken up and divided. The crop is watered with sewage in the spring and early summer. There is no sale for this crop after the marketing period is over. The crop is not grown on the sewage farm proper, but on that portion of the land reserved for works.

Rotation of Cropping.—No regular system of rotation of cropping is observed on this farm, owing to the fact that every year a large part of it is sacrificed in dealing with the sewage-sludge. Experience gained on this farm shows no deviation from the general rule that rye-grass pays best; next mangolds, then follow cabbages; and that sewage does not answer so well for any other crop, and also that the growing of garden stuff on a sewage farm is more or less a mistake. The farm is well-managed, clean, and generally in good order, and shows signs, when more land is obtained, of being quite a success.

Farm Buildings.—The farm buildings are new, very convenient, and complete, arrangements having been adopted in the design to economise both labour and straw.

Cattle.—Thirty-four cows in milk, of a mixed character, principally Shorthorns, have been bought in for milking, and there are, besides, ten feeding cows, six yearling heifers, and one Shorthorn bull, bred on the farm. All dry and barren cows are fatted on cut hay, linseed-cake, and bean-meal, and are then sold to a butcher. Cows for milking are bought in just before they calve. The calves are sold at three or four days old, and realise from 35*s.* to 40*s.* each. The cows are kept in full milk about six months. In summer the milking cows are fed twice a-day on dry stuff, and three times a-day on green food, the food used being rye-grass, cotton-cake, and bean, oat, or maize-meal. When feeding on grass each cow has 2 lbs. of decorticated cotton-cake and 4 lbs. of oat, bean, or maize-meal. In the winter the cows are principally fed on brewers' grains, cut hay, bean, oat, or maize-meal, all of which are steamed. Each cow yields in the six months, when in full milk, 2¾ gallons per head per day; and this milk is sold at 9*d.* per gallon of four quarts in the summer, and 9½*d.* in the winter. The heifers on the farm are put to the bull when 21 months old, and calved.

Sheep.—In February 1879 there were forty-two Shropshire ewes on the farm, which had been purchased in the previous autumn and put to a ram. They were an excellent lot of ewes, and in very good condition, and certainly seemed to thrive upon the rye-grass pasture. They produced seventy-two lambs, being at the rate of 1⁵⁄₇ths per ewe, which had mostly been sold to the butcher, fat, at prices from 38*s.* downwards. The ewes had decorticated cotton-cake and kibbled maize on the pastures, and were in turn sold fat, as it was not considered well to keep them for a second year on the sewaged land, and they are found to pay well by being kept for only one year.

Pigs.—There were about forty-five pigs of the Berkshire and the large white breeds on the farm. They are fed upon unsaleable vegetables, steamed with sharps and pea-meal. They are principally sold as porkers, at prices varying from 10*s.* to 11*s.* per score. Eight pigs were being fed for bacon.

Horses.—There are nine working horses kept on the farm, and also two two-year-old colts, two one-year-old colts, and a foal. The horses are partly used on the outlet works in addition to the ordinary farm-work.

Sanitary.—Eighteen persons reside on the farm, including nine children, and ten others work on it.

Mr. J. Anscombe, the manager, writes:—"There are three cottages on the farm. These were erected three years back. There are families at each house, and, as far as I am aware, no doctor has been on the place.

"No children or persons resident on the farm have died.

"None of the men employed from the commencement of the farm have died; but two of the men who had previously been engaged on the borough sewers, and were transferred therefrom to the tanks in 1858 and 1859, have; but they were men over 60 years of age." Mr. Anscombe adds: "The men, as a rule, are very healthy, also the inhabitants of the adjoining neighbourhood."

William S. Till, Esq., C.E,, the borough engineer, writes, 9th August, 1879: "I have to inform you that I have been connected with the Saltley Sewage Works and Farm since their commencement, and can say of my own knowledge that there has not been any epidemic during the whole period; in fact, I have repeatedly remarked the healthiness of the men employed thereat."

CLASS 2.—CROYDON SEWAGE FARM AT BEDDINGTON.

AT Croydon, sewage irrigation as a mode of purifying sewage has been practised for a longer period than in any other town in this country. The amount of land formerly used, however, was of small extent, consisting of grass-land which was unprepared for the reception of the sewage. In the year 1857 the sewage of Croydon proper was applied to but 15 acres of land. It was not until the year 1860 that a large portion of the present farm was taken on lease by the Croydon Local Board from various owners, and was let to Mr. John Marriage for a term of eleven years. At the end of the year 1860 this farm was so far completed that 100 acres of it were under irrigation. The total acreage of the farm at that time was 301 acres, of which not more than 240 acres were at any time irrigated with sewage. In the year 1871 the farm was extended, so that at the present time it contains the following areas:—

	A.	R.	P.
Freehold land of the Croydon Local Board	55	3	2
Leasehold from Dr. Shorthouse	37	2	15
„ Mr. Quilter	191	0	27*
„ Mr. Beddington	171	0	19*
	455	2	23

After the expiration of Mr. Marriage's lease in 1871, the farm was let to the Croydon Irrigation and Farming Co., Limited, at the full rents paid by the Local Board, together with interest on capital expended. In three years this Company lost 7072*l.*, when they were relieved of the undertaking on paying a fine of 500*l.*, which appears in the accounts of 1874, and this sum, together with the back rents and interest paid by the Company, makes this year's undertaking appear to have been remunerative. Since the stoppage of the Company, the farm has been worked by the Croydon Local Board under the charge of a manager. Mr. Joseph Parrott is the present manager, with whom an arrangement had been made at the time this sewage farm was entered in the competition, that he should take over the farm; but this arrangement has not been carried out, and he still continues the management for the Local Board.

Not more than 360 acres of the whole farm are at present under sewage irrigation at any time. Having regard to the fact that certain crops are not irrigated (such as oats) during their period of growth, the area of land to which the sewage is actually applied does not exceed 320 acres all the year round. The population of the district draining on to this farm is estimated at 55,000, so that the sewage of at least 170 persons is constantly applied to each acre of land irrigated in the course of a year. The quantity of sewage applied in twelve months, from October 1878 to September 1879, was equal to a daily volume of 140 gallons per head per day of the population.

The sewage is brought on to the farm at Beddington by two outfall sewers; one from Croydon proper, the other bringing the drainage from the southern side of the Norwood Hills. The sewage is discharged on to the farm by direct gravitation. Previously to the liquid sewage passing on to the land, it is passed through Mr. Baldwin Latham's patent sewage extractors, which remove the sand, solid fæces, paper, &c. These extractors consist of revolving screens, which are actuated by the sewage itself, so as to continuously remove the solid matter as fast as it is conveyed down by the sewers. The machinery for the extraction of the solids from the Norwood sewage is placed upon the upper end of the sewage farm, and that for the removal of the solids from the sewage of Croydon proper is situated at a place called Brimstone Barn, which was formerly the site of large sewage tanks, in which the sewage was treated with a view to purification, and is between the town and the farm. The volume of sewage passing daily on to this farm varies immensely. During the past year, in addition to the extraordinary wet season, large quantities of subsoil-water have been passed into the sewers by reason of the construction of new sewers within the water-line of the district, the water from the sewer trenches being admitted into the sewers as they are constructed. These new sewer operations have more than doubled the volume of the sewage in the sewers of Croydon during the past year, and in the twelve months from October 1878 to the end of September 1879, 12,557,790 tons of sewage were passed on to the farm from both outfall sewers, an amount equivalent to a depth of 388·5 inches on the 320 acres actually irrigated, in addition to the local rainfall, which was 33·4 inches during the same period—the actual quantity of sewage applied per acre at Croydon being seven times greater than that applied per acre at Leamington during the same period. The whole contents of the sewers at Croydon are at all periods discharged on to the farm, there being no storm-water outlets by which any portion of the water from the sewers can escape at any point into the adjacent streams. The Croydon sewage farm is an exception in this respect to the other sewage farms which have been inspected, as it deals completely with the whole sewage of the place in all weathers. It should be observed that a large portion of the rain falling on the streets of Croydon is not admitted into the sewers, but is conveyed away direct to the natural water-courses of the district.

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* These areas have been purchased by the Croydon Local Board since the inspection of the farm by the Judges.

The soil of the farm is well adapted for the purpose of sewage treatment. It is a light soil, resting on a gravel subsoil, consisting of a light gravel drift overlying the Woolwich and Reading beds of the Tertiary formation. The farm is admirably adapted for irrigation, both from the character of its soil and the gradient of the slopes. Experiments have been made upon seven samples of soil from this farm. A sample of light peaty soil absorbed 103·0 per cent. of its weight of water, while the subsoil from the same field was found to be a heavy marl, absorbing 25·9 per cent. of its weight of water. A sample of gravelly surface-soil was found to absorb 48·5 per cent. of its weight of water, and another sample of very similar soil from another field absorbed 49·7 per cent. of its weight of water. The subsoil of gravel from under this latter sample absorbed but 13·1 per cent. of its weight of water. A sample of surface-soil of dark colour, consisting of gravel and containing fine roots, was found to absorb 65·9 per cent. of its weight of water. The subsoil from under this sample was very open gravel, which would absorb but 9·4 per cent. of its weight of water. These two last samples were taken from a field noted for its taking large volumes of sewage; and in fact a very considerable volume of sewage can be applied to this field for several days, and but little effluent water will flow off. The farm is not drained to any great extent, and it is more or less water-logged, and would be greatly improved both by surface and subsoil drainage; but what is urgently required is the removal of the large and increasing volume of the subsoil water from the sewers. Notwithstanding the enormous volume of sewage which is poured on to this land, the effluent flowing off at all periods of our inspection was clear and limpid.

A great portion of the farm consists of worn-out rye-grass. Water-grasses were to be found luxuriating in many of the fields, yet, notwithstanding, the farm carries a great number of horses and cattle. Some of the fields were very much poached, and the herbage was damaged, by the cattle which were depastured thereon. The sewage is conveyed and distributed over the farm in earth-cut carriers, and generally these carriers were clean and in good order.

The Local Board's accounts, since they have had the management of the farm, show that there are only two years in which the accounts are complete in themselves, viz. 1874 and 1878, as in these years alone has there been a valuation at the commencement and termination of the financial year. The summary of the accounts for the two years for which the returns are complete—1874 and 1878—are as shown in the table on page 66.

The profit and loss for the respective years ending 25th March, 1875, 1876, and 1877 are shown by the following account:—

CROYDON SEWAGE FARM.

ACCOUNT for the YEARS ending MARCH 25, 1875, 1876, and 1877.

INCOME.	£	s.	d.	EXPENDITURE.	£	s.	d.
Valuation, 25th March, 1877 ..	5,151	8	6	Valuation, 25th March, 1874 ..	4,732	3	9
Receipts—				Expenditure—			
Year ending 25th March, 1875	7,256	0	0	Year ending 25th March, 1875	10,636	5	1
" 25th March, 1876	6,760	0	0	" 25th March, 1876	9,577	13	8
" 25th March, 1877	7,162	6	4	" 25th March, 1877	9,390	3	2
Balance-Loss on 3 years' working	8,006	10	10				
	£34,336	5	8		£34,336	5	8

Loss = £2668 16s. 11⅓d. per annum.

BEDDINGTON SEWAGE FARM ACCOUNTS.

1874.

INCOME.	£	s.	d.	EXPENDITURE.	£	s.	d.
Valuation, 25th March, 1874	4,732	3	9	Valuation, June 1873	5,238	18	7
Received from Tenants for Rents, Fines, Interests, &c.	2,720	2	0	Purchase of Stock	901	7	6
General Receipts	6,131	16	1	Allowance to Tenants	180	0	0
				Rents and Expenses	7,030	13	0
				Balance-Profit	233	2	9
	£13,584	1	10		£13,584	1	10

1878.

INCOME.	£	s.	d.	EXPENDITURE.	£.	s.	d.
Valuation, 25th March, 1878	6,074	18	3	Valuation, 25th March, 1877	5,151	8	6
Receipts	7,585	3	11	Payments	11,408	8	4
Balance-Loss	2,899	14	8				
	£16,559	16	10		£16,559	16	10

INCOME.	£	s.	d.
Valuation, 29th September, 1878	5,003	9	6
Sale of Milk	2,320	4	2
" Grass	1,199	16	4
" Vegetables	375	14	4
" Mangolds	32	7	6
" Cattle	833	8	8
" Horse	29	11	0
" Pigs	22	10	8
" Calves	28	19	6
" Stock keep	196	9	4
" Wheat	171	18	9
" Hay	128	2	0
" Sewage Manure	73	10	0
" Potatoes	4	0	0
Law Costs	75	0	0
Cancelled Cheque	11	18	0
Rents	168	2	6
Balance-Loss	6,496	13	8
	£17,171	15	11

EXPENDITURE.	£	s.	d.
Valuation, 25th March, 1878	6,074	18	3
Rent	4,582	0	0
Wages	2,541	18	5
Manager	200	0	0
Insurance	16	8	5
Rates, Taxes, and Tithes	499	12	6
Coal and Gas	26	16	2
Forage	642	7	5
Seeds	121	8	1
Repairs, Carts, Vans, &c.	50	3	0
Tools and Implements	138	4	2
Harness and Repairs	69	18	11
Maintenance and Repairing buildings	127	19	5
Fencing	54	12	1
Grains	139	7	6
Purchase of Cattle	1,198	1	0
Advertising, Printing, &c.	11	15	9
Income Tax	110	8	4
Cost of Valuation and Sale of Cattle	133	19	0
Threshing Corn	70	5	3
Manager's disbursements	37	7	10
Carriage of goods	13	17	9
Law Costs paid	10	10	0
Drain Pipes	21	3	9
Plans of Farm	10	8	0
Hurdles	4	4	0
Veterinary	62	8	9
Gauging Sewage	5	4	0
Conveyance	5	5	0
Material for Culverts	134	17	9
Repairing Culverts	3	15	0
Repairing Sluices	2	12	6
Timber for Bridges	43	10	0
Miscellaneous	6	7	11
	£17,171	15	11

The 55¾ acres of freehold land is charged in the accounts with £500 per annum rent.

As no valuation was made at the end of the year, the valuation made on the 29th September has been included in the account of income and expenditure (p. 67). This valuation, amounting to 5003*l.* 9*s.* 6*d.*, is divided into two items, viz. 3185*l.* 8*s.* 6*d.* for live and dead stock, and 1818*l.* 1*s.* 6*d.* for tillages, &c. With reference to this valuation, however, it should be said that a valuation made at Michaelmas would naturally be more than one made on the following Lady Day, which is the end of the financial year at Croydon. This is shown to be the case by actual experience at Croydon, for a valuation of this farm on the 29th September, 1876, amounted to 5928*l.* 4*s.* 9*d.*, and at the following Lady Day it amounted to 5151*l.* 8*s.* 6*d.* It will be seen, therefore, that the loss on working during the past year amounted to the large sum of 6496*l.* 13*s.* 8*d.*, being at the rate of not less than 14*l.* 5*s.* 2*d.* per acre, or a sum greatly in excess of the very large rent which is paid for this farm. It should be observed, in reference to the accounts of the Croydon sewage farm, that, with the exception of the last year, the losses in which have been increased by reason of the excessive volume of cold spring-water passed on to the farm, the apparent loss is not so great when compared with other farms, provided the same amount of rent and taxes were paid as at Croydon. This is apparent when the account for the year ending the 25th of March, 1878, is compared with the Leamington Farm account of 1877, which shows a balance of profit in the year of 567*l.* 3*s.* 4¾*d.*; but the sewage farm at Leamington only pays 2*l.* 4*s.* per acre rent, and Croydon 10*l.* per acre rent, and the rates and taxes are proportionately higher at Croydon, so that if Leamington had to pay the same rent, &c., the loss would have been greater per acre at Leamington than at Croydon.

The cost of preparing the farm at Beddington for sewage purposes has been comparatively small. By an arrangement entered into with Mr. John Marriage, the first tenant, the Local Board had a portion of the farm laid out at a cost of 3*l.* per acre, which was the amount they allowed to Mr. Marriage for the work. The cost of the sewage extractors and buildings, laying out additional lands (about 120 acres), including culverts for conveying the sewage on to the lands, makes the total 7722*l.* 6*s.*, made up as follows:—

	£	*s.*	*d.*
Mr. Hayward's contract for culverts, erection of buildings, and extractors on farm	2217	9	9
Messrs. Burton and Waller, sewage extractors at Brimstone Barn	1406	9	3
Messrs. Peskett and Taylor, building for sewage extractors at Brimstone Barn	537	19	1
Laying down additional land, construction of culverts, &c.,, including superintendence, about 120 acres laid out £3040 7*s.* 11*d.*, less fine deducted from contractor, £200	2840	7	11
Amount paid Mr. Marriage, 240 acres laid out, at £3 per acre	720	0	0
Total cost of works	£7722	6	0

The following table gives the cropping for the year 1879 :—

	Acres.		Acres.
Italian rye-grass	180	Brought forward	416½
Permanent pasture	120	Celery	1
Mangolds	40	Seed-beds	0¾
Oats	41¼	Parsnips	1
Waste	28	Rhubarb	4
Cabbage	3½	Parsley	0½
Vegetable marrows	1½	Savoys	20
Sprouting broccoli	1¼	Coleworts	10
Sage	1	Osiers	1¾
Carried forward	416½	Total	455½

Rye-grass.—This is the principal crop grown both for sale and consumption. The crop is sown either in the autumn or the spring. Three bushels per acre of seed are sown, and the crop is allowed to stand fully three years, and it is regularly irrigated with sewage.

Mangolds.—Mangolds are grown on this farm both for home consumption and for sale. They are drilled on ridges 26 inches distant, and the plants are 18 inches apart. Various kinds are grown, but the "Yellow Intermediate" is the favourite sort. In 1878, mangolds were not large, but were of good quality. In 1879 they presented a very poor and unhealthy appearance, and, having been sown early, largely ran to seed, and the crop was very foul. The water-logged condition of the land injured the crop and prevented its being properly cleaned.

Cabbages.—Cabbages are very largely grown on this farm. There was one field clean and well set out, but not sewaged. The common cabbages are all planted on ridges 24 inches distant, and the plants are 24 inches apart on the ridge. Savoys are also planted at the same distances. Coleworts are planted on broad ridges 12 inches distant on each side of the ridge, and 12 inches distant from each other. The cabbages on some parts of the farm are irrigated, and on other parts they have had no sewage.

Broccoli are grown on ridges 24 inches distant, the plants being 24 inches apart, in a field which has not been irrigated for some years.

Rhubarb.—This is a crop that is largely grown. It is pulled and sent to the London market for sale. After the marketing period is over no use is made of the residue. It is grown from roots which are divided every three years, and which roots are planted 3 feet by 2½ feet apart, and, when planted, receive a good dressing of farmyard-manure. The crop is also manured in the autumn. Unlike the practice on other sewage farms, the rhubarb on this farm is not irrigated with sewage, and it has been grown on the same land for the last seven years.

Sage, *Parsley*, *Vegetable Marrows*, *Parsnips*, and *Celery* are also grown on this farm; but these crops, with the exception of celery, are not fitted to be treated with sewage, and none of them have been so treated. The celery is grown from plants reared in frames on the farm, and is planted in rows 6 feet apart, the plants being 7 inches from each other on the level; it is gradually earthed up as the plant grows.

Oats.—Oats are now grown, and one field was a grand crop, but it was not sewaged.

Wheat.—Wheat has also occasionally been grown, but it is not sewaged.

Osiers are grown on one or two plots. French and Brown willows are the varieties grown. The sets are planted 2 feet by 1½ foot apart each way. The crop is used in marketing the garden produce. The osiers are planted in damp positions, and are not directly irrigated with sewage.

Rotation of Cropping.—The rotation of cropping pursued on this farm is, first, rye-grass for three years, followed by cabbage or other vegetables; these again are followed by mangolds, and then a cereal crop is taken, after which is a return to rye-grass.

Cattle.—From forty to forty-five cows in-milk are kept, some of which are bred on the farm, others are usually bought in before or just after calving. Some of the cows are Shorthorns, and the others are half-bred. The calves are sold off to local dealers at from one to three weeks old. The milk is mostly sold on the farm, wholesale, at from 11½*d.* to 1*s.* per gallon of four quarts; but some is now retailed in Croydon at 1*s.* 4*d.* per gallon. The average daily yield of a cow is from two to three gallons. The cows are fed in the summer with rye-grass and cotton-cake, and are turned out to grass. In the winter they are entirely stall-fed with hay, pulped mangolds, distillers' wash, grains, cut straw, and cotton-cake. Occasionally, and as required, the cows have either cotton- or linseed-cake, according to the requirements of the case. Fourteen bullocks were being fed on the farm, and were ready for sale at the time of our inspection. The food for the bullocks consisted of a mixture of pulped mangolds, distillers' wash, hay, and cut straw, with some corn. There were about fifty head of other cattle on the farm lying out and being fed on hay in the winter, and grazing in the summer. The milking stock are not kept in such condition as we observed on other farms, so that when a cow fails or becomes barren, a considerable loss is entailed between the buying and selling price, or they have to be expensively fed, before they are ready for sale. The cows were not kept in such a cleanly condition as we observed with satisfaction on other sewage farms. Sawdust was largely used for litter in the sheds. The cow-sheds are old, and are by no means so convenient as those either at Leamington or Reading.

Horses.—Eighteen horses are kept to work on the farm, and for taking the produce to the London markets. There are seventeen carthorses, partly Flemish-bred and partly English, and there is one nag on the farm. The manager has observed that the horses on this farm are much subject to grease.

The farm is open as a lair for cattle and horses that are taken in to graze. The weekly charge is 5*s.* for small horses and ponies, and 6*s.* for large horses. Stock are charged at the rate of 3*s.* a week for a cow or a bullock, 2*s.* 6*d.* for a heifer, and 4*d.* per head for sheep. At these prices it was found that a dairyman sent his stock on to the farm, but it is questionable if this mode of dealing with the crop pays, as the cattle destroy a considerable amount of grass when the land is moist. All the fields containing cattle were much poached, and a large part of the herbage was destroyed.

The farm-manure from the sheds and folds is used on that part of the farm which is not irrigated, and on the market-garden.

Sanitary.—Ninety-four persons reside on the farm, including thirty children, and, in addition, fifty-four persons are at present engaged at work upon the farm. The number of persons, however, working on the farm a few years back, when market-gardening was more in vogue, was still greater.

Mr. J. Parrott, the present farm-manager, reported that no form of epidemic disease has ever manifested itself on the farm during the period that he has had the management of it.

One death, an infant one month old, is all that has been recorded as having taken place on the farm, and that was reported as "delicate from its birth," and one death from consumption had occurred among those working on the farm. Mr. Parrott stated that the health of those engaged on the farm is "remarkably good."

The Female Orphan Asylum at Beddington is contiguous to the Croydon sewage farm, and contains a large number of inmates. The matron wrote, in reply to an inquiry made by the farm-manager, as follows, "6th August, 1879.—During the last two years we have had about 170 orphans in the school, and twelve or thirteen adults. We have had no illness of a serious character, and not one death amongst the girls since the 1st September, 1876. The orphans are taken in from all parts of the country, and many of them are the children of delicate parents."

Mr. George Horseley, who managed this farm for some years, both under the Farm Company and the Local Board, reported, 12th September, 1879, that "the health of the men engaged on the sewage farm at Beddington during the time I had the management was very good. I do not remember any of them having any illness of any kind to prevent them from coming to their work. Peade, the waterman, had been fourteen years on the farm, and had never had a day's illness during the time. I have some men working for me at the present time who state that they never had their health better than when they were at work at the irrigation farm; in fact I consider an irrigation farm as healthy for the workmen as any other farm. With regard to the deaths, three occurred during the period I was there. The first was Bedlow, Mr. Marriage's old foreman. He died from some inward complaint, and had been ill for some time. Another was a child who died of scarlet fever. In this case it was clearly shown that the child had the fever when it came on to the farm. It had only been on the farm a few days when it was taken ill. The father of the child had been living near the barracks at Croydon. In the next house to that in which he lived were some children ill with the scarlet fever, and I believe that some deaths had occurred, which clearly showed that the child had caught the fever before it left Croydon. The other death was a little boy who was accidentally run over by a waggon on Mitcham Common. These are the only deaths that occurred during the time I was there, and it was the only time scarlet fever was on the farm."

Mr. F. M. Coldwells, who was also for a short time manager of the farm under the Farm Company, wrote, Sept. 9th, 1879: "Although a great many hands were employed on the Croydon irrigation farm during the time I was manager, and at least two families with children resided on it, I only knew of one case of sickness." This case was that of a man who attended the sewage extractors on the farm at Beddington; but he soon recovered, and shortly afterwards left the farm at Beddington, but has since been engaged on other sewage farms, and is now employed on the sewage farm at Northampton.

CLASS 2.—READING SEWAGE FARM.

THE Reading Sewage Farm is known as the Whitley Manor Farm. It is situated between two and three miles to the south of Reading, and is the property of the Corporation of the Borough of Reading, Mr. W. W. Champion being the farm manager.

The farm contains an area of 688 acres, of which

350 acres are pasture,
325 " " arable,
13 " " let in allotments.
688 acres.

The entire area of land purchased by the Urban Sanitary Authority of Reading for the purpose of sewage disposal was about 770 acres; and this area, exclusive of legal expenses, but inclusive of compensation to occupiers and of a sum of 4000*l.* awarded to Mr. Attenborough, the owner of the adjoining property, for consequential damages, was about 80,300*l.* Up to the time of our inspection 76 a. 0 r. 10 p. had been laid out for irrigation, and 54 acres were then under preparation for irrigation, but to which no sewage had been applied. The farm was established in 1875 for the purpose of purifying the sewage of Reading, which town, we were informed, now contains a population of about 40,000 people, the sewage of 33,000 of whom is passed on to the farm.

The sewage of Reading is collected by intercepting sewers, and is conveyed to the pumping station placed in the lower portion of the town, upon the banks of the river Kennett, at a point where a weir crosses this river. Here the sewage is screened through an inclined grating fitted with a mechanical rake, which is occasionally worked by machinery, and it is then pumped on to the farm. At all ordinary times the water-power of the river Kennett is utilised for pumping the sewage. It drives three turbines, two of which are coupled together, and the remaining one is reserved for use when the head of water is low. The turbines work four single-acting force-pumps 18 inches in diameter, the length of the stroke of the pumps being from time to time adjusted in proportion to the power available, the maximum length of stroke being 30 inches. When the river Kennett is in flood, and at other times when necessary, the sewage is lifted by steam-power. At the pumping-works there are a pair of horizontal high-pressure condensing steam-engines. Each engine has a steam cylinder 24 inches in diameter, and 42 inches length of stroke, and drives a pair of plunger pumps 30 inches in diameter and 36 inches stroke. The sewage is conveyed from the pumping-station to the farm, a distance of 2·43 miles, partly in a 24-inch cast-iron main 2712 yards long, which discharges into a 3-feet brick culvert 1571 yards long, the lift of the pumps to the farm being 43 feet. At the pumping station there is a storm-water overflow which communicates with the river, and which comes into action when the sewers are surcharged. The sewage pumping-station, including the cost of a new set of sluices across the river Kennett, and the sum of 804*l.* paid for the site, cost 24,501*l.*, and the delivery main and brick sewers in connection therewith have cost 12,329*l.* 17*s.* 5*d.* The annual cost of pumping and of attention to the cleansing and flushing of the sewers, on an average of two years ending 31st of August, 1879, has been 731*l.* When the sewage arrives upon the farm it is distributed on the surface from earth-cut carriers, the main carriers in all cases being earthenware pipes laid below the surface of the land.

The soil of that part of the farm already laid out for irrigation varies somewhat, being partly heavy and partly sandy loam. The subsoil is partly heavy clay, partly gravel, and partly peat. Experiments made with two samples of soil show that one sample of the soil absorbed 47·3 per cent. of its weight of water, and the other sample, being lighter soil, absorbed 30·4 per cent. of its weight of water. The absorbent properties of the soil show that the land is of a porous description and well adapted for sewage purposes. The worst feature, however, of this farm is its liability to be flooded. No less than 350 acres are liable to be flooded; and on the two occasions of our inspection we found large portions under water, viz., on the 12th of February, and the 29th of May, 1879. We have since been informed that floods of the character experienced last year (1879) are very rare, and only occur at long intervals. The sewaged land has been under-drained in some parts 4 feet deep, the drains being 30 feet apart, but over the greater portion the drains are 60 feet apart, though some of the land has been drained as closely as 15 feet apart. An area used for filtration was in a completely water-logged condition, the land having been very much overdone with sewage. Most of the land also appeared to have had too much sewage. The portion under irrigation was fairly cultivated and decently clean, considering the quantity of sewage it has to receive. The volume of sewage passed on to the farm varies from a minimum of 500,000 gallons to a maximum of 800,000 gallons per day. It is only passed on to the farm between the hours of 6.30 A.M. and 5.30 P.M. every day; and in the night-time, or at such other times as it is not passed on to the farm, the sewage accumulates in two receiving tanks at the sewage pumping-station and in the outfall sewer at Reading.

The amount of capital expended in preparing the 76 a. 10 p. of land for irrigation has been as follows:—

				£	s.	d.
Pipe-carriers				557	13	1
Distributing Boxes				85	1	6
Culverts over Stream				35	9	9
Preparation of Land	£1239	19	2			
Hedge-grubbing	176	2	0			
Filling up Old Ditch	20	4	3½			
Cleansing out New Ditches	9	14	4½			
				1445	19	10
Drainage of Land				511	15	1
Forming Roads				284	6	2
Diversion of Stream				37	2	10
Depreciation of Plant used on Works				68	9	4½
				£3025	17	7½

The expenditure actually incurred includes the amount spent on 2 acres which were prepared for sewage, but are now occupied as the site of the new farm buildings.

The following accounts give the Profit and Loss on this farm during the last three years:—

READING SEWAGE FARM.

STATEMENT of ACCOUNTS for the YEAR ending MICHAELMAS, 1877.

INCOME.	£	s.	d.
Valuation, Michaelmas, 1877	8,967	4	3
Rents and Tithes received	167	14	6
Sale of Hay	149	11	4
,, Stock	1,208	11	0
,, Milk	1,694	15	2
,, Butter and Cream	28	16	4
,, Rye-grass	354	5	6
,, Wheat	348	16	6
,, Swedes, Mangolds, &c.	43	5	6
	£12,963	0	1

EXPENDITURE.	£	s.	d.
Valuation, Michaelmas, 1876	6,677	12	0
Farm Steward's Salary	150	0	0
Purchase of Stock	881	5	0
Harness, Implements, Machinery, &c.	326	19	10
Seeds	115	12	4
Horses and Cattle Keep	755	1	5
Carriage of Milk	62	19	0
Wages	1,406	1	3
Smith's Work and Shoeing	62	9	9
Veterinary	20	1	0
Horse Hire, &c.	62	12	0
Steam Cultivation	31	19	0
Conveying Town Refuse to Farm	58	12	0
Artificial Manure	15	7	6
Sundry Disbursements	91	14	1
Tithes, Rates, and Taxes	490	18	7
Valuation to outgoing Tenant	51	7	6
Fire Insurance	19	15	9
Repairs to Farm Buildings	194	11	5
Deepening Ditches	139	19	0
Balance-Profit*	1,348	1	8
	£12,963	0	1

* No rent included for freehold land farmed by Sanitary Authority. Cost of pumping sewage not included.

READING SEWAGE FARM.

STATEMENT of ACCOUNTS for the YEAR ending MICHAELMAS, 1878.

INCOME.

	£	s.	d.
Valuation, Michaelmas, 1878	10,742	16	5
Rents, Tithes, &c., received	247	1	6
Sale of Hay	138	9	1
„ Stock	1,207	2	10
„ Milk	2,163	6	0
„ Butter and Cream	2	6	9
„ Rye-grass	247	13	11
„ Wheat	246	16	0
„ Feed, &c.	17	13	9
Hire of Horse preparing Land	30	0	0
	£15,043	6	3

EXPENDITURE.

	£	s.	d.
Valuation, Michaelmas, 1877	8,967	4	3
Farm Steward's Salary	225	0	0
Purchase of Stock	321	9	0
Harness, Implements, &c.	182	7	1
Seeds	78	13	0
Horse and Cattle Keep	1,119	18	2
Steam Cultivator and Threshing	152	12	3
Veterinary	26	14	3
Smith's Work and Shoeing	79	7	3
Wages	1,916	7	3
Carriage of Milk	66	13	2
Sundry Disbursements	56	10	10
Tithes, Rates and Taxes	483	11	8
Rent of Fobney Mead	8	0	0
Fire Insurance	36	15	0
Repairs to Buildings, &c.	353	6	8
Deepening Ditches, Grubbing Hedges, &c.	95	16	9
Balance-Profit *	872	19	8
	£15,043	6	3

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* No rent included for freehold land farmed by Sanitary Authority. Cost of pumping sewage not included.

READING SEWAGE FARM.

STATEMENT of ACCOUNTS for the YEAR ending MICHAELMAS, 1879.

INCOME.	£	s.	d.	EXPENDITURE.	£	s.	d.
Valuation, Michaelmas, 1879	10,452	4	10	Valuation, Michaelmas, 1878	10,742	16	5
Tithes received	37	12	10	Farm Steward's Salary	200	0	0
Rent	67	3	10	Purchase of Stock	547	6	9
" for Site of New Waterworks	30	0	0	Harness, Implements, &c.	165	1	11
Sale of Hay and Seed	236	1	6	Seeds	104	11	9
" Stock	1,135	16	1	Horse and Cattle Keep	1,010	19	4
" Milk	2,196	15	4	Steam Cultivation and Threshing	212	2	5
" Mangolds	181	18	5	Veterinary	37	13	4
" Rye-grass	99	11	11	Smith's Work and Shoeing	72	13	1
" Wheat	560	4	0	Wages	2,105	13	3
Horse Hire for preparing Land for Sewage Irrigation, Filling Ditches, &c.	83	8	0	Carriage of Milk	45	15	3
				Sundry Disbursements	83	7	2
Balance-Loss*	1,223	6	1	Tithes, Rates and Taxes	572	16	8
				Fire Insurance	24	1	6
				Repairs to Buildings, &c.	280	4	0
				Works of Drainage, Ditching, Grubbing Hedges	99	0	0
	£16,304	2	10		£16,304	2	10

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* No rent is included in the accounts; the loss is therefore in addition to the rent of the land. Cost of pumping sewage not included. During this year 140 acres of land were taken out of the farm for the purpose of being prepared for sewage, and this, with the damage arising from floods and the diminished value of all produce, will account for the loss.

The following table gives the cropping of the farm for the year 1879:—

	A.	R.	P.
Beans	38	0	0
Mangolds	7	0	0
Wheat	31	2	0
Oats	96	0	0
Mangolds (irrigated)..	31	3	0
Cabbages (irrigated)	8	0	0
Rye-grass	51	0	0
Land under Preparation for Sewage ..	140	0	0
Grass-land	271	3	0
Let in Allotments	13	0	0
Total	688	0	0

Rye-grass.—This is the principal crop grown on the land to which sewage is applied. By preference the crop is sown on fallows in August, but occasionally it has been sown with the corn crop in the spring of the year. The quantity of seed sown per acre is 3 bushels, and we were informed that the crop should not be allowed to stand longer than two years. The rye-grass is usually cut six or seven times a year, and is partly consumed on the farm and partly sold to customers who fetch it away. In May 1879 the crop then being cut was selling at the rate of 8*l.* per acre ready cut on the ground. It receives large quantities of sewage during the period of its growth.

Mangolds.—The most notable feature of this farm was the marvellous crop of mangolds grown in 1878; 118 tons of Mammoth Long Red Mangolds (tops and roots) having been grown on one acre, and 92 tons per acre without tops. It is generally said that mangolds forced to such an amazing size are of small value, and will not keep, but in this case we saw the last of them at the end of May 1879, and they were then sound and good. The mangolds are largely consumed on the farm, but some were sold last year in the field at 17*s.* per ton, or delivered in Reading at 20*s.* per ton. Forty-eight tons per acre of Yellow-Globe Mangolds were grown in 1878 on arable land after wheat, and were not sewaged. Mangolds are grown on the level. Six pounds of seed per acre are drilled in rows at 27 inches apart, and the plants are hoed out to 15 inches' distance in the rows. It cost 15*s.* per acre to hand-hoe the plants, which are also three times horse-hoed. The crop of 1879 was sown at the end of April, and was rather an irregular plant from an excess of sewage. The sorts of mangold grown on this farm are Long Red, Berkshire Prize, Intermediate, and Golden Tankard. The crop is irrigated with sewage up to the time of hand-hoeing, and if the weather is dry it is watered up to within six weeks or two months of the time of pulling.

Cabbages.—This crop was grown on the irrigated land in 1878, but owing to the water-logged condition of the land, arising from the quantity of sewage obliged to be got rid of, and, from the severe frost, the crop was destroyed in the winter. Cabbages are grown on ridges 3 feet distant, and the plants are from 18 inches to 36 inches apart on the ridge, depending upon the variety grown.

The *Cereal Crops* on this farm are grown on land that is not sewaged, and are cultivated under the ordinary course of husbandry.

Cattle.—There were on the farm at the time of our inspection eighty-one cows in-milk, sixteen cows dry in-calf, twelve barren cows, twenty-four two-year-old heifers, twenty-three one-year-old heifers, fifteen two-year-old steers, thirty-three one-year-old steers, fifty calves and three bulls, making in the whole 257 head of cattle. All the stock are well-bred shorthorns. The cows are milked to within about two months of calving, and they yield on an average two gallons of milk per head per day all the year round. The milk is partly sold in Reading and partly sent to the London market. It realises 10*d.* per four quarts, except that sold in London, which is sold at three prices, viz., 1*s.* 8*d.*, 1*s.* 6*d.*, and 1*s.* 4*d.* per barn gallon. The milking-cows are fed in the summer on Italian rye-grass, and each cow also receives some fine pollards, the quantity depending on the state of the rye-grass. In the winter the milking-cows are fed on mangolds, cut hay, and fine and coarse pollards, and they sometimes have a few crushed oats. The calves are not allowed to suck the cows, but are reared by hand on Simpson's meal and new milk until they are old enough to turn out. Steers are sold fat when about two years old. The heifers are put into the herd. The barren cows on the farm were an excellent lot, and would soon be ready for the butcher. The yearlings were good and healthy, and seemed to be doing very well. The bulls on the farm are "King of the Roses" (36,853), "Baron Havering 13th," by "3rd Duke of Geneva" (23,753), and "Wanderer," by "Earl of Ashfield" (36,571). The milking-cows were clean, well kept, and in good condition, four men being employed to look after them, and they are assisted by four others in milking.

Horses.—Nineteen horses, mostly of French breed, are kept on the farm; and in addition to ordinary farm work they are engaged for some period in the year drawing manure and refuse from Reading to the farm, and in the preparation of fresh land for sewage purposes.

Buildings.—The old farm buildings, which are mostly wooden barns, have been converted into capital places for the young stock. New buildings have been erected for the milking-stock, horses, &c. These buildings are well planned, and contain every convenience for preparing the food of the stock. There is a steam-engine on the premises which drives the food-preparing machinery, pulper, mill, &c.; and for mixing the food there are convenient places, which are connected with the cattle sheds by tramways. The manure is also removed in small trucks running on tramways direct from the sheds to the manure pits, which consist of water-tight and shallow pits. The cows all stand on open-slated wooden floors, an arrangement which is considered to save litter. Water is laid on to each of the sheds, and the whole buildings are very complete and suitable for their purpose. The sum of 5090*l.* 17*s.* 4*d.* has been expended by the Corporation of Reading in constructing the new farm buildings, in the erection of cottages, and in the adaptation of the old buildings to the present requirements of the farm.

Sanitary.—Sixty-three persons live on the farm, including thirty-two children. Twenty-five others are engaged on the farm who do not reside on it.

Mr. W. W. Champion, the farm manager, reported that one child died at the age of five weeks, "wasting away from the birth." Measles and whooping-cough appeared on the farm last winter and spring. These diseases had been "prevalent in Reading and its neighbourhood." No adults living or working on the farm have died, and, "judging from the experience of the past, sewage irrigation does not seem prejudicial to health, no children (who would be the first to suffer) can be more bright and healthy; the men who attend to the irrigation (one of whom has been walking in the sewage and cleaning out the carriers for more than four years) are perfectly healthy, proving that by a wise provision of nature the earth and vegetation seize hold of and convert to plant-food matters injurious to health."

II.—*Notes on Market-Gardening and Vine-Culture in the North-west of France.* By H. M. JENKINS, F.G.S., Secretary of the Society, and Editor of the 'Journal.'

SOME of the statements in this paper will appear to many persons so remarkable that it is desirable to preface them with a few words of explanation. In the first place, it should be stated that my notes were taken in 1878; and although the wonderful intercalation and succession of market-garden crops which I shall indicate were taken successfully in that year, I cannot speak as to the results obtained by means of the different systems under the continued deluges of rain which the French agriculturists as well as ourselves experienced throughout 1879. I know, however, from correspondence, that the past year has been very disastrous to the poorer gardeners in the Amiens district. What France has suffered from the unseasonable and inclement succession of seasons which characterised last year could only be ascertained by another investigation; and that the recently appointed Royal Commission on Agriculture have provided for.

It has seemed to me, however, that these notes, which represent the operations and results of ordinary seasons, might be usefully published at a time when everyone is discussing the great questions which bad harvests and the effects of foreign competition have forced upon all classes connected with the land. Those who may carefully study the following pages wi doubtless be struck, as I was, with these two facts: (1) Th the market-gardens in the districts which I have selected are o very poor land, judging it from an agricultural point of view and (2) that the quality of the land has much less to do with it productiveness than the available supply of water. Indeed, if on were to divide the market-gardens into separate orders, classe or other divisions, as a naturalist divides animals or plant according to the differences between them, the result would b very much as follows:—

1. Market-gardens with water under the soil.
2. Market-gardens with water on the soil.
3. Market-gardens with water above the soil.

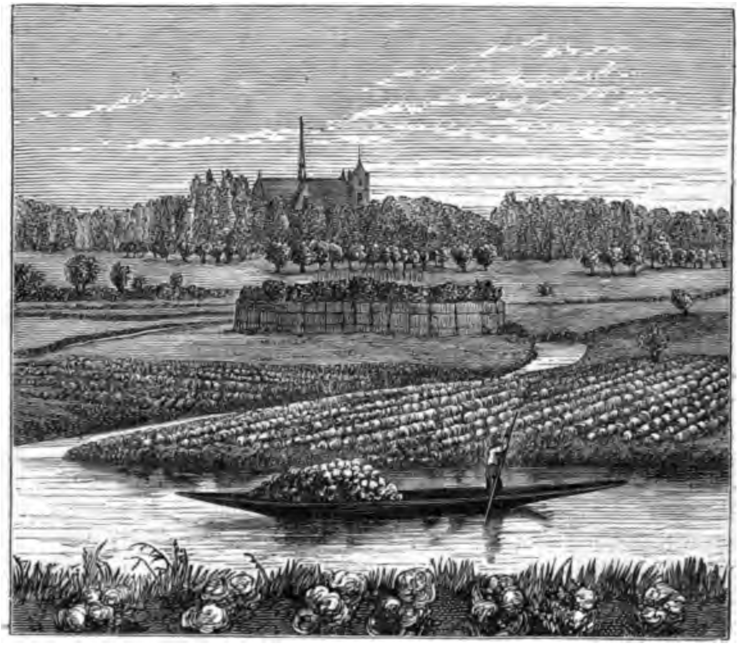
In the order just mentioned it will, perhaps, be as well t take the three classes of market-gardens, namely, (1) those nea Amiens on water-logged peat; (2) those irrigated by sewag near Paris; and (3) those near Paris watered by artificia means. In addition, some notes will be given on the method of cultivation of certain plants, such as asparagus, dandelion figs, and vines, which are pursued in certain localities in th north-west of France.

One more word is necessary in explanation of a practice whic is common to all descriptions of market-gardening in Franc Englishmen will read with some astonishment the enormou amount of care bestowed across the Channel on the cultivatio of salads, and the large proportion of garden-land occupied b them. But it must be remembered that neither the déjeûne nor the dinner is in France considered complete without a well made salad. The consumption of lettuces, endives, radishes cresses, and things of that kind, is something enormous pe head of the population; and so discriminating is the publi taste that each of these plants is divided and sub-divided int varieties, each one of which has its proper season and uses All this care is not confined to the production of the plant; i is continued into the kitchen, and is completed in the dining-room. Indeed, there are few French ladies who consider thei daughters' education complete if they cannot make a salad in a manner which will at the same time satisfy the requirements o the artist, the *savant*, and the *gourmet*. But for this specia feature of French living, it is doubtful whether the market-gardeners of Vaugirard, for example, could afford to pay hal the rent that they now do.

AMIENS PEAT DISTRICT.

Every one who has travelled from Boulogne to Paris on the Northern of France Railway must have noticed near Amiens a tract of peat-bog, consisting of alternate patches of land and water, the former nearly swamped but nevertheless bearing crops of garden produce. A day spent in exploring this region would well repay, not only the professional market-gardener, but every one interested in political economy. The district is about 2000 acres in extent, parcelled out in patches of small size. These patches are divided by ditches varying in width from six feet to many yards, and all sufficiently deep to allow the easy passage of the canoe-like boats which are universally used by the gardeners to convey manure from the town to the gardens, and produce from the gardens to the river-side market. The canoes are pushed along in the narrower and shallower ditches by means of a boat-hook, but in the larger and deeper canals they are propelled by means of a paddle, with singular dexterity and swiftness, by a man or woman sitting aft.

Fig. 1.—*View of Market-gardens in the Peat-district near Amiens.*



The gardens rarely exceed 2½ acres in extent, and one of that size would be managed entirely by a man and his wife, but then the work is simple slavery. In the summer the women work on three days in the week from half-past two in the morning until ten o'clock at night, and on the alternate days from 5 A.M. until 10 P.M., making an average of about eighteen hours per day! In the winter they work from daylight until dark. Similar hours are observed by the men, and they do the heaviest portion of the work. If the workpeople are hired, the women receive about 1*s.* 5*d.* per day, and the men 2*s.* 4½*d.*

In some cases the gardeners are owners, and in others they are tenants, of their land. The drier land is let at an average rental of nearly 5*l.* per acre; and the good land, with a portion of it peaty and only slightly decomposed, lets at still higher prices, while the value of the fee simple exceeds 160*l.* per acre. Considering that one-fifth of the so-called acreage consists of water and only four-fifths of land, it should be interesting to learn how the gardeners manage to pay such rents and earn their livelihood out of such small gardens; and how they obtain a gross produce, estimated to average 35*l.* per acre, out of a peat bog.

The following description, in which it is assumed that a new garden is to be made, is drawn from information which I obtained partly from M. Mannechets, President of the Society of Agriculture and Horticulture of the Somme; but chiefly from M. Racquet, the Professor of Agriculture at Amiens, who accompanied me on my visits to the market-gardens. One of the largest proprietor-gardeners of the district, M. Maille, of Neuville-l'Amiens, paddled us about and amongst the gardens, and very intelligently explained and practically illustrated any points of special interest.

Preparation of the soil.—A certain quantity, generally a thickness of 6 inches, of peat, which forms the subsoil, is brought up to mix with the top soil, and thus give it a fertility which it does not naturally possess. The depth from which the peat is obtained varies, of course, with the nature and depth of the surface soil; but from two to three feet may be taken as an average. Beneath the peat is a layer of impermeable clay, which is never touched in any case. After the peat has been mixed with the surface soil, and in some cases coincidently with the mixing, a "double dressing" of stable-dung from Amiens, namely, from 20 to 24 tons per acre, is given. This manure costs 11*s.* per ton, and probably the great demand for it is the explanation of its very high price. No lime is used as manure, and the great object of the gardeners is to preserve the vegetable fibres in the peat as long as possible. After a certain time, however, varying from 12 to 20 years or more, the land gets "tired" of the continual cropping, and then its fertility is renewed by an admixture with it of the same quantity of peat as before, followed by a double manuring as just described.

I have stated that one-fifth of the nominal acreage consists of water. Therefore the owner or occupier of the garden has the right to renew the fertility of his land by obtaining peat or mud from his side of the bed of the adjoining ditches, instead of from the subsoil of his land.

When the land has been fairly brought into cultivation it is dug by hand every winter two spits deep, and in spring it is manured with from 10 to 12 tons per acre of stable-dung, which is forked in immediately before the first sowing. During the last few years a sewage-manure, manufactured by the Goux process, has been somewhat extensively used at the rate of rather more than one ton per acre, with less than a ton of ordinary stable-manure. The Goux sewage-manure is said to contain 2½ to 3 per cent. of nitrogen, 3 to 4 per cent. of *phosphoric acid*, and 1½ to 2 per cent. of potash, and its price is 5*l.* per ton, which is as high in proportion as the cost of the stable-manure.

Courses of cropping. — Doubtless many variations in the system of cropping which I shall describe may be found in the Amiens market-garden district, but I believe the following statement will give a fair general idea of the system pursued. It should be noted, in advance, that the gardeners generally grow their own seed, as they assert that seed obtained from even the best seedsmen generally fails; and it is quite conceivable that a process of acclimatizing both seeds and people is necessary to a successful result under the circumstances.

(1.) In February the land is sown with a mixture of short radishes and Tongrés carrots, and as these are gathered they are succeeded by a mixture of onions, leeks, and winter lettuces, which come off in succession. The lettuce is called "gliante," meaning glossy or shining, and has its leaves bordered with a reddish tinge. Amongst the onions a few seeds of cauliflowers are sown, for the purpose of bearing seed.

It is impossible to say what the portion of land devoted to the above course in one year will bear the next, but it may be assumed that it will be one of the following, and probably all of them will be taken in turn. In fact, the course just described appears to occupy about one-third of the gardens every year, and thus onions are not taken on the same ground more than once in three years.

(2.) This course is essentially devoted to the Marjolaine potato, which is planted in February. Between every second row of potatoes, and in place of a third, shoots of artichokes are planted in April, the plants remaining not more than two years.

The distance between the rows of potatoes or of potatoes and artichokes is about 18 inches. Sometimes, the bed is planted entirely with potatoes, and in that case they are succeeded by cauliflowers with lettuces between them, or with lettuces and chicory (endive) in place of cauliflowers.

(3.) In the August of the previous year, Batavian lettuces having been sown, and pricked out in October or November, they are gathered in May, and are succeeded by haricots sown in May or June.

(4.) In November of the previous year, about the 25th, peas having been sown in double rows a foot apart, with a distance of 4 feet 6 inches between each double row, a line of savoys is planted in May in that interval, and, like the peas, gathered as soon as ready, and as the ground is cleared various salads are planted.

(5.) This course consists of winter cabbages, which had been sown in August or September, planted out as soon as possible, and gathered in June. The cabbages are followed by carrots, which are again succeeded by chicory (endive) in August or September.

It should be added, that a piece of land is devoted to the raising of seedling cabbage, savoy, lettuce, and other plants, to be pricked out as required.

General remarks.—The quantity of land cultivated by one person is generally in a number of pieces, more or less distant from one another. This is not objected to, as an accident happening to one part of the district, such as a flood, or a storm of wind or hail, is not then so likely to affect all the plots belonging to one man to an equally injurious extent. Very ingenious temporary and movable fences are made of willow-twigs, mats, and all kinds of refuse material, in order to protect the plants from frost and from the prevailing winds.

The drier the season the better for this kind of gardening, as vegetables and salads are dearer in dry weather, and the Amiens marsh-gardens rarely or never want watering, in consequence of the water-level being so near the surface of the land The porous nature of the soil is increased, or, at any rate, carefully preserved, by the annual diggings and manurings.

The produce of these gardens is very large in quantity, but the quality of the vegetables is not the best. Although rarely or never watered, the crops are nearly always watery, and deficient in flavour. Thus, market-gardeners who cultivate ordinary light land, and who frequently have to water their crops, can sell cabbages, for instance, at 10 centimes each, when the Amiens gardeners have to be content with 4 or 5 centimes a piece for most of theirs. Still, there can be no doubt that a large amount of valuable produce is economically obtained from a soil which an uninitiated observer would consider impossible to cultivate under the circumstances which I have attempted to describe.

When taking leave of M. Maille, I mentioned the bogs of Ireland, told him of their neglected condition, and their microscopic rents, and asked him whether it would not be worth his while to make a personal examination of them with a view to emigration. His exclamation, evidently sincere, was:—"*Si j'étais jeune!*"

SEWAGE MARKET-GARDENING.

Sewage-farming has already been frequently treated of in this Journal; and the Report of the Judges of the Sewage Farms which were entered to compete for the Prizes offered by the Mansion House Committee, in connection with the recent International Agricultural Exhibition at Kilburn, immediately precedes this article. The best results hitherto attained in England by the application of sewage to the land are there described in detail. The object of this short notice is much less ambitious, namely, to draw attention to the manner in which sewage is profitably applied in the vicinity of Paris to the growth of market-garden crops,—a means of utilising fæcal matters which appears to have been hitherto somewhat neglected in the United Kingdom.*

It is obvious that all farmers cannot turn market-gardeners, if only because fresh vegetables deteriorate by being carried long distances. On the other hand, land that is utilized for the defæcation of sewage is nearly always close to a large town, where market-garden produce is in great demand. It therefore seems a natural inference that the growth of vegetables, fruits, and flowers, adapted to the requirements of the local market, should be one of the principal objects of the sewage-farmer, if experience or experiment should prove that sewage-irrigation is favourable to the profitable production of such crops.

In England, this question is at present a matter of experiment, while in France, on the sandy plain of Gennevilliers, it has for some few years been demonstrated to be a success, by the experience on a considerable scale of many occupiers of barren land, which had hitherto been nearly worthless from either a horticultural or an agricultural point of view.

If we refer to Mr. Morton's description of "Half-a-dozen English Sewage Farms," published in the Second Part of this

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* The Judges of Sewage Farms remark, "That the growing of garden-stuff on a sewage farm is more or less a mistake."—*Vide* suprà, p. 61.

'Journal' for 1876, the then position of the market-garden question will be made apparent by the paucity of references to market-garden crops in the 32 pages of the Journal which that paper occupies. On p. 417 it is stated that there were, at Heathcote, near Leamington, 7 a. 3 r. 6 p. of market-garden in 1872, followed by cabbages in 1873. In 1874, there were 10 a. 1 r. 34 p. of parsnips, potatoes, and carrots; followed in 1875 by rhubarb, mangold, and cabbage; and in 1876 by rhubarb, grass, &c. This is out of a total of 400 acres under sewage irrigation. In fact, as Mr. Morton observes, "a beginning has been made at market-gardening" (p. 420). At Doncaster rather more had been done, though some little doubt appeared to exist as to the value of the sewage for fruit-crops. Mr. Morton's statement is as follows:—"Probably the speciality of the Doncaster sewage farm is its garden ground, which, lying admirably for the reception of sewage, will, no doubt, ultimately be enormously productive. Besides ordinary garden vegetables, there were beds of fruit—strawberries, gooseberries, and currants; all of which had been sewaged, and owed their productiveness, in some measure, *so it was believed*, to the occasional irrigation which they had received."

At Bedford, more attention is paid to market-garden crops; as rhubarb, cucumbers, cauliflowers, red-cabbage, asparagus, vegetable marrows, &c., are all grown, in addition to large acreages of potatoes, onions, and carrots (*see* p. 431); and "at Wrexham, where Colonel A. Jones makes his sewage farm profitable, the market-garden plot is one of the most productive fields he has" (p. 436).

In contrast to this brief sketch of the slow-growing germ of sewage-gardening in England,* as told incidentally by Mr. Morton in 1876, let me trace briefly the rapid extension of this means of utilizing sewage, which has taken place on the sandy plain of Gennevilliers. This is a north-western suburb of Paris, which I visited under very favourable circumstances, owing to the kindness of M. Henri Vilmorin, the reporter of the Commission to which allusion will presently be made.

Commencing in 1869 with less than 18 acres of land under irrigation, the area devoted to the utilization of sewage has annually increased, until in 1877 it amounted to between 800 and 900 acres, and in 1878 to nearly 1000 acres, while the rent of the land per acre has been augmented four-fold. This increase of rent is some measure of the value attached to the sewage as a fertilizer, because a mere nominal charge is at present made for it, and each farmer is allowed to turn on to his land as much or as little as he chooses, and at such times as he considers it desirable that his crop should be irrigated. Land which, before sewage-irrigation was possible, let at no more than from 25*s*. to 35*s*. per acre, although so near Paris, now easily commands from five to seven guineas. The produce of the land has changed from a miserable yield of 12 to 16 bushels of rye or oats, to such enormous receipts as a gross money return of from 48*l*. to 64*l*. per acre from cabbages, and of from 80*l*. to as much even as 160*l*. yielded by cauliflowers. Other vegetables, such as carrots, onions, and artichokes, have yielded nearly as large a return, as also have peppermint, absinthe, and other savoury herbs.

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* It is curious that the English sewage farms on which market-gardening has been attempted, viz. Bedford, Wrexham, Leamington, and Doncaster, are those, to which prizes have been awarded. *Vide* the Report of the Judges of Sewage Farms, *passim.*

About one-sixth part of the sewage of Paris is conveyed to the pumping-stations at St. Ouen, Clichy, and St. Denis; but a comparatively small portion of this fraction has hitherto been utilised, the remainder being still conveyed into the Seine. In this respect the sewage-gardeners of Gennevilliers have a great advantage over the occupiers of sewage farms who are compelled to pass over their land the whole of the sewage conveyed to it at all seasons of the year, whether the crops require irrigation or not, and whether the season is wet or dry. Therefore, with a view to encourage the application of sewage to the land, the authorities have given leases of the sewage for nine years to the present concessionaires, the rent being under 5*s*. per acre for the first three years, and the charge to be revised at the end of each period of that duration.

M. de la Trehonnais has already described the sewage gardens of Gennevilliers so thoroughly in this 'Journal,'* that it is unnecessary to travel over the same ground. Some peculiarities of cultivation may, however, be noticed, more particularly in reference to the manner in which the sewage is conveyed and applied to the growing crops.

At the present time the sewage is conveyed from the pumping-station to the fields in large closed conduits; and not until it is diverted into the main carriers on the land is it exposed to the open air. In this way the nuisance which is more or less inseparable from a sewage farm is reduced to a minimum. On the land itself there are the usual series of main and secondary open carriers, and the latter are placed at right angles to the ridges. These ridges, on which the crops are grown, are not more than broad enough for two rows of cabbages. The sewage is turned out of the small carriers or gulleys into the furrows between the ridges, and thus *do not come into actual contact with the growing plants*, as is the case when they are grown on the flat. Generally, two parallel rows of cabbages, cauliflowers, &c., are planted on each ridge; and scarcely a crop is to be seen without another and smaller or later crop coming forward between the plants of what may be termed the main crop. These peculiarities in the methods of cultivation and irrigation, in addition to the porous nature of the soil, have probably much to do with the successful application of sewage to market-garden crops at Gennevilliers.

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* Second Series, vol. xii. Part I. pp. 109 to 128, 1876.

It must be admitted, however, that many of the market-gardeners at Gennevilliers give evidence of the abundance and strength of the sewage by becoming careless of the growth of weeds. That the foulness of much of the land was not a necessity of the system or the season, was made manifest to me by a visit to the land in the occupation of the authorities of the city of Paris. This is, indeed, a garden, whether judged by the abundance of the crops, the variety of the plants cultivated, or the cleanliness of the land.

According to a report of a Commission appointed by the Prefect of the Seine to inquire into the results of the application of sewage to market-garden crops, it appears that general yields were 30 to 50 tons per acre of cabbages, 48 tons of beetroots, from 20 to over 50 tons of carrots, and 6 tons of haricot beans. But these figures by no means represent the total produce of the land in the course of the year, for not only is there generally an intercalated crop, but after the cabbages, &c., are sold off there is generally time to take another crop between the plants of what was the "intercalated crop," but which after the sale of the cabbages becomes the main crop. Of other and more valuable crops than those already quoted, the following yields are given:—Artichokes 14,000 to 32,000 heads per acre; cauliflowers, 8000 to 12,000 heads, weighing from 14 to 16 tons; garlic, 15 tons; celery, more than 40 tons; onions, 24 to 32 tons; leeks, 24 tons; potatoes, 12 to 16 tons; pumpkins, 48 to 56 tons; and salsify, 4000 to 5000 bundles, weighing as much as 10 tons. The reporter of the Commission adds, that if these figures are compared with the produce of land not irrigated, the difference will be found in some cases to be even five times in favour of the irrigated land. Not less satisfactory have been the results obtained from the growth of scent-bearing and savoury herbs; for instance, peppermint has yielded from 16 to 20 tons per acre in two cuttings, absinthe from 44 to 48 tons, and angelica over 11 tons the second year. The quality of the herbs and vegetables has been found excellent from every point of view, and many of the large hotels in Paris regularly obtain their supplies from the sewage-gardens of Gennevilliers; but it is found necessary in the case of savoury herbs to avoid irrigation for at least a fortnight before gathering the crop. With regard to fruit-trees and nursery-plants generally, the Commission express themselves in equally favourable terms, while acknowledging the greater difficulty in bringing these products of the soil to so satisfactory a comparative test as can be easily done in the case of vegetables, flowers, and herbs.

The general conclusions arrived at by this Commission were formulated as follows:—

(1.) The application of sewage to horticultural products, and particularly to large vegetables, is practical, and sanctioned by experience. It presents considerable advantages from three points of view:—
  (*a*) The abundance and the beauty of the products obtained.
  (*b*) Their quality and their healthiness.
  (*c*) The money return from their cultivation.
(2.) Green vegetables, such as cabbages, celery, spinach, lettuces, endive, as well as the edible roots and the savoury herbs, are all specially adapted for sewage irrigation.
(3.) The quantity of sewage absorbed by one acre cropped with vegetables may at present be 21,000 cubic yards per annum. That quantity will probably be reduced by the effect of improvements in the processes of irrigation.
(4.) The distribution of the sewage by means of irrigating furrows is the method which appears most commendable.
(5.) The irrigation should be moderate, intermittent, and frequently renewed.
(6.) The sewage should not be allowed to come into contact with the foliage or stem of the cultivated plants.
(7.) It is desirable that the position of the furrows should be frequently changed.

It may be asked whether, if so large a measure of success has attended the application of sewage to market-gardening at Gennevilliers, the system will not be extended so as to flood the Paris markets. At present this contingency is so remote that it need not be seriously discussed. One circumstance alone renders the extension of the sewage-gardens more and more difficult, and that is, the cost of labour and the difficulty of procuring it. At present, the ordinary pay of a garden-labourer ranges from 4*s.* 6*d.* to 5*s.* per diem; but, *en revanche*, the day's work round Paris averages 14 hours.

MARKET-GARDENS OF PARIS.

The brilliant French capital abounds in attractions to every class of Englishman, but it is doubtful whether anything more interesting to the cultivator of the soil can be found than the market-gardens on the outskirts of the city, and especially those within the fortifications in the quarter and neighbourhood of Vaugirard.*

The market-gardens within the *enceinte* of Paris occupy an area of nearly 3500 acres. The largest are about 2½ acres in extent, and the smallest are scarcely more than an acre. The gardener is not often the owner of his land, and the rent paid varies chiefly with the distance of the garden from the central market (Halle) of Paris. Each garden has attached to it a dwelling-house, a stable, a cart-shed, and an elevated reservoir of water, generally supplied from a well, the water being pumped up daily by horse-power. An abundant supply of water, which can be economically distributed as required, by means of numerous hydrants and attached hose, is an essential element of success, and forms invariably one of the most important adjuncts to the garden. The system of cultivation is essentially a forcing one, with a view to bring vegetables of all kinds very early in the year to the Paris market. The land itself plays, comparatively speaking, a subordinate part in the growth of the crops, its place being taken by a mixture of earth and manure known as *terreau*, which cannot be properly made in less than four years, and beneath which a layer of long manure is placed. The garden is therefore a great hot-bed, covered more or less with glass in the colder months, but of course open to the sun and air in summer. Instead of giving any general description of the management and results of these gardens, I will briefly state the facts relating to two gardens at Vaugirard, and merely glance at two others at greater distances from the market, and in the less fashionable neighbourhood of St. Denis.

The first garden which I visited at Vaugirard is in the occupation of M. C. Lecomte, and comprises 1 acre 16 perches. The rent is 56*l.* per annum, and the annual expenditure for manure 96*l.* The plant, including bell-glasses, frames and lights, implements, horse, &c., had cost between 600*l.* and 650*l.* The courses of cropping are as follows:—

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* I am again indebted to M. Henri Vilmorin for special facilities in making an inspection of the market-gardens at Vaugirard, St. Denis, Étampes, Mantes, and elsewhere.

(1.) Cabbage- and cos-lettuces, sown at the end of September, are pricked out in the beginning of November, covered with glass, and sold in February and March. Carrots are sown between the lettuces in January and February; and as the lettuces are sold a second crop of salads is grown, and cauliflower plants are pricked in between the carrots. After the carrots are sold, corn-salad or spinach is sown, and thus ends the year under this course, which requires a layer of 18 inches of a mixture of old and green dung to be placed under the *terreau*, so as to form a mild hotbed to encourage the growth of the earlier crops.

(2.) White onions having been sown in a seed-bed in the beginning of August, they are pricked out in September, and sold in April, after which lettuces, and then early cauliflowers, are planted, the latter in May to be succeeded by celery, which had been sown in April. The celery is generally planted on the flat, instead of in trenches, and close together. It is blanched by being covered completely with a layer of straw or long manure; but some gardeners, especially for the later sorts, dig up the plants, cut off their leaves, and put them in "by the heels," as we should say, in a trench, completely covering them with earth.

The next garden I visited was in the occupation of M. Laurent, who rents $2\frac{1}{4}$ acres of land, including house, &c., at 120*l.* per annum. His stable-manure costs him 200*l.* per annum, under a series of contracts at rates varying $1\frac{2}{5}$*d.* to 2*d.* per horse per day. His plant is said to be worth 1400*l.*, including the cost of a machine for warming frames with hot water instead of manure, for the purpose of growing early carrots, and 200*l.* for hand-glasses and lights for frames. He has three courses of cropping, viz.:—

(1.) Sows turnips (Navets de Vertu, race Marteau) at the end of January and beginning of February. In May he plants melons as the turnips are sold, and then pricks in cauliflowers between the melons. After the melons are sold, corn-salad or winter spinach is sown between the cauliflowers, which are marketed in the autumn, and the land is cleared during the winter.

(2.) Turnips or carrots are sown as in the previous course, but are succeeded by endive (chicory or escarole) pricked out in place of melons. The salads are followed by cauliflowers and winter salads as in course No. 1.

(3.) Early York cabbage is planted out at the end of October, and amongst these cos-lettuces are pricked out. These are followed by early cauliflowers and cos-lettuces, and again by late cauliflowers and cos-lettuces.

On one of the courses in each year the latest kind of celery is grown instead of cauliflowers. The crop is pulled up in November, and put in trenches to preserve the plants until March, when celery is both scarce and dear. As a rule the course of cropping of each piece of land is changed every year.

Men begin work during the season at three o'clock in the morning, and they receive 3*l.* per month wages in addition to board and lodging. M. Laurent keeps three labourers, and he and his wife also do their part in this hard business. If we reckon rent, rates, and taxes, expenditure on manure and labour, including keep and the wages of himself and wife, keep of horse, cost of seed, repairs, and interest on capital, it seems to me that the outgoings on this garden of 2¼ acres cannot be much less than 800*l.* per annum, and the marvel is that, even with such a succession of crops as I have indicated, it can be made to pay.

At St. Denis, one of the gardens which I visited was managed on the same system as those just described. It was remarkably well done, and when I saw it was more than half covered with a luxuriant crop of celery, which was then receiving a copious watering, and would soon be blanched by being covered with straw. The celery had been preceded by melons, and these by various salads, again preceded by carrots. On one plot there had been six crops in the year up to the date of my visit, Sept. 14. This garden contained a trifle under two acres, and the rent was 80*l.* per annum, including, as in the preceding cases, the house and other "etceteras." The gardener informed me that his total expenses of all kinds amounted to 28*s.* (35 francs) per diem, money paid out of pocket, or 511*l.* per annum.

The other garden was two miles farther north of Paris, and although not so well managed the system was the same, with the exception that very early vegetables could not be grown, I was told, as they are at Vaugirard, this being a much later district. The garden was 2 acres 16 perches in extent, the rent was 56*l.* per annum, or the same as M. Lecomte's at Vaugirard for half the area, and the expenditure on manure did not exceed 80*l.* per annum, being much less than M. Lecomte's. This latter difference doubtless has much to answer for, and I quote it chiefly to show that the enormous expenditure on the other gardens is not reckless or wasteful, but is deliberately adopted as the result of the experience of generations as the best means of obtaining small vegetables and delicate salads, when those luxuries command the high price which the Parisian *gourmet* is willing to pay.

"On the plains," as it is termed round Paris, the small farmers grow common market-garden crops on the following system:—

(1) Early peas, sown wide enough apart to admit of (2) early potatoes being planted between them. After peas they plant (3) haricot beans, and after potatoes sow (4) late peas. Again, after haricots they plant early cabbages to come off in the spring, peas being sown in their due season between the rows of cabbages, and so on as before.

CULTIVATION OF SPECIAL PLANTS.

In the suburbs of Paris there are market-gardens on a larger scale than the walled gardens of Vaugirard, some of which are devoted to the cultivation of fruits and vegetables requiring special mention; also in the district of Amiens there are market-gardens on a larger scale than in the peat district. The land in these cases consists of the usual marly soil of the country, and large quantities of strawberries, asparagus, and dandelions are cultivated, in addition to lettuces, cabbages, cauliflowers, and other usual market-garden plants. Of late years the mode of cultivation of asparagus has been entirely altered in this and other districts of France. The method now adopted was originated at Argenteuil near Paris—the headquarters of the asparagus culture—and is commonly known by the name of that fertile suburb of the French capital. The systematic cultivation of the dandelion on a large scale has been introduced very recently, and the market-gardeners as well as the consumers are enthusiastic in its praises.

Dandelion.—This plant, used to a certain extent in England for medicinal purposes, but otherwise despised by us as a troublesome weed, is now carefully cultivated in France for the purpose of being used as a salad, in the middle of winter, after it has been blanched by covering it with earth or sand to the depth of three or four inches for two or three weeks. No less than five varieties are quoted in last year's list of seeds issued by the well-known French seedsmen, Messrs. Vilmorin-Andrieux & Co. Its great merit, in addition to its hygienic properties, is its abundance at a time of year when most other salads are very scarce.

The seed is sown in nursery beds in April, rather a heavy soil being preferred. In May and June the plants are pricked out in rows two feet apart, and eight inches' distance between the plants. The seed may also be sown in rows the same distance apart as before, and the plants afterwards thinned, and singled to a distance of eight or ten inches between them. The plant being indigenous to our climate, as well as to that of

France, variations of temperature have little effect upon it. To obtain the best results and a delicate salad, it is necessary to purchase seed of the improved varieties, as the wild dandelion is coarse in comparison.

Asparagus.—Argenteuil, as already stated, is the locality in France most celebrated for the growth of this succulent vegetable, but it is grown very largely near Amiens, Valery-sur-Somme, and many other places, on a gigantic scale. One grower wrote to me in 1878 asking if I could help him to dispose of 100 bundles per day during the season! M. Godefroy-Lebeuf, who sells one-year-old plants to growers, had last year between 7 and 8 acres in seedlings at Argenteuil, and from him I have derived on the spot much of the information which is given below.

Great care is taken in the selection of the seed. M. Godefroy-Lebeuf never uses any seed of his own growth, but he travels about the district at the period of flowering, and selects for purchase in the autumn the most vigorous female stems which he finds in close proximity to strong and healthy male stems, frequently paying as much as 5 or 6 francs for one female stem. Even with all this precaution it is not thought advisable to use all the seeds on the selected stem, but only those on the lower branches. The seeds are extracted by macerating the fruit in water, and they are generally kept two years before being sown.

The land is prepared for sowing by ploughing it not more than 8 inches deep with a specially light iron two-wheel plough, the right wheel being smaller than the left. The seed is very carefully sown in lines 32 inches apart by women and children. The land between the rows is kept very clean by frequent harrowings and hoeings. The period of sowing varies somewhat in different districts, March and April being preferred near Amiens, and the beginning of June at Argenteuil.

Seedling plants thus raised are sold when one year old for planting out. If older plants are used the result is not so good. The plantation is made in April, in the following manner:—Trenches about 8 inches in depth and 4 feet apart are dug with a spade, but the land beneath is not disturbed, as it is better left solid. The earth from the trenches is piled on the lands between them. *No manure is used.* After pruning their roots, the young plants are placed a yard apart in the trenches, care being taken to spread out the root-fibres laterally. They are then slightly covered with earth, which is well trampled upon. A stake is driven into the ground to mark the position of each plant, and also to enable the young shoots to be tied to it, and thus prevent them from being broken by the wind. Care is taken not to injure the roots with this stake, which is therefore driven into the ground some inches from the crown, so that the portion above the ground shall incline towards the plant. Nothing more is done the first year than to keep the trenches free from weeds, and the plant free from the asparagus beetle as far as possible, and to tie the young shoots to the stake as they grow up. If the weather should prove very hot, 2 or 3 inches more earth is placed over the crown of the plant, but not otherwise. If the season is rainy, some earth will be washed down from the sides of the trench. In either case, in the month of November, the stems are cut at about a foot above the ground, the earth covering the crown and roots is removed carefully, leaving them nearly, but not quite, exposed to the air. This operation is performed with a short-handled Dutch hoe, which is worked circularly all round the crown, the earth upon which is finally removed by the hand. In the spring, about March, the roots are again covered with earth, but to a slightly greater depth than was done in the previous year, the operations of which are otherwise repeated to the letter. The third year the crown is still more deeply covered with earth, and farmyard-manure is placed in the trenches in the intervals between the plants, but not over them. A few shoots may be carefully cut if they come up close together, but not otherwise. This cutting enables the plant to throw lateral shoots. Before cutting any shoots the earth is carefully removed from the sides of the crown, so that other shoots may not be injured by the operation. After this period the shoots may be systematically cut, but not too hardly this the first year of cutting; the earth is gradually added to cover the growing shoots in order to blanch them. Some growers put manure every winter in the trenches along their whole length, but M. Godefroy-Lebeuf prefers to place the manure in the ridges, as he holds that manure in direct contact with the roots of asparagus produces deformed shoots. With proper treatment the roots of the plants will, in the course of a few years, cover the whole of the space between the original plants. In the meantime the ridges are cropped with potatoes, cauliflowers, and other garden plants; but ultimately, as the crown rises gradually towards the surface, the ridges entirely disappear.

It must not be inferred that asparagus is always grown so systematically even in France, for one frequently sees, even in the Argenteuil district, that asparagus has been planted in a shallow hole here and there, where a vine has failed, or where some other cause has produced a vacant spot.

At Argenteuil the rent of land devoted to the growth of asparagus exceeds 7*l.* per acre, whereas ordinary agricultural land in the same commune does not fetch more than half that amount.

Although there are a number of so-called "sorts" of asparagus, M. Godefroy-Lebeuf thinks that there are really only two—the early and the late. The former has the advantage in price, and the latter in the quantity of produce.

Figs.—An outline of the mode of cultivation of the fig, carried out on a large scale in the neighbourhood of Paris, may be interesting to English fruit-growers.

Two slanting trenches are made in the spring so as to form a letter V, and slips one year old are planted in them so as to make an angle with the earth of about 45°. The first year they are allowed to grow naturally and without pruning, but in October the side branches are cut off, and three or four weeks later the main stem is bent down to the ground, and all the new wood, including the growing point, is placed in a shallow trench, and covered with a sufficient layer of earth to prevent the frost from getting access to the plant. In the spring, on a dull day, the earth is removed, and a few days afterwards, the growing point is cut off. As soon as it is possible to distinguish the fruit-buds from the leaf-buds, which grow side by side from each axil, all the leaf-buds are nipped off except one on each side close to the old wood. The fruit-buds thus left on last year's wood will produce fruit this year; and in the autumn the fruit-bearing wood will be cut down to the new branches which have been produced by the two leaf-buds selected in the spring for the purpose. Similar operations are performed every year, and particular attention is given to cut off any shoots which may grow on the old stem. New stems or suckers from the roots are allowed to grow to a limited extent, and are treated in the same way as the original shoot. When grown on a large scale, the trees are planted in lines about 20 feet apart in each direction. M. V. F. Lebeuf, in his little book, entitled 'Les Asperges, les Fraises, les Figues, les Framboises, et les Groseilles,' mentions a curious but simple method of hastening the ripening of the fig, namely, when the eye is yellow, and apparently about to dilate, the skin being also brilliant and inclining to yellow, it is sufficient to put on the eye the least touch of olive oil in the early morning or evening, and in nine days the fruit will be ripe. He adds a caution that if the operation is performed before the fig is ready, or in a blaze of sunshine, it does more harm than it would otherwise do good.

VINE-CULTURE.

It would be impossible to describe the various methods of cultivating the vine, as practised in the several vine-growing districts of France within the limits at my disposal. Further, most of the French wine-growing districts possess a climate so entirely different from our own, that little would be gained by writing such a treatise for English readers. As, however, there are certain very important vine-growing districts in the north-western portion of France, some notice of the peculiarities in the cultivation of the vine, which distinguish them from each other, may fitly be added to the notes on market-gardening given in the preceding pages.

There are some apparently anomalous facts in reference to vine-culture which may be enumerated at the outset. (1) The poorer the land the better the quality of the produce of the grape, whether wine or brandy; and, inversely, the richer the land in the same district the larger the quantity of the produce. (2) The best grapes are grown on hill-sides or elevated ground with a southern aspect. (3) Grapes grown in valleys are of bad quality, and in some districts absolutely worthless for wine-making. The difference of a foot or two in the elevation of the land has a marked effect on the quality of the grape for wine-making purposes. (4) The number of vines planted per acre in the best districts varies enormously. Thus in the Medoc, from which are obtained the splendid wines of Chateau Lafite, Chateau Margaux, and many other clarets of less note, not more than 2500 vines are planted per acre; while in the equally celebrated district of Champagne about nine times the number of vines are planted on the same space of ground. More curious still, in the Saumur district, where also sparkling wine is made, not more than one-tenth of the number of vines are planted per acre as compared with the practice in Champagne.

Champagne.—It is unnecessary to state that vines have been cultivated in this district from a very remote period; and, although it is one of the most northern vine-regions of France, it is certainly one of the most renowned for its product; and to those who are connoisseurs of sparkling wine it stands second to none. During the last sixty years many improvements have been made in the cultivation of the vine and the manufacture of its produce, and probably every inch of suitable ground in the district is now turned into a vineyard. The following notes have been for the most part obtained from MM. Ayala, of Ay, near Epernay, to whom I am very much indebted for information and hospitality.

The kind of grape almost exclusively grown is the black Burgundian sort known as Pinot, but in certain vineyards, on the left bank of the Marne, different varieties of a white grape are grown, and the wine from them is much sought after by the merchants for the purpose of giving to the produce of the black grape that amber colour which is preferred by the drinkers of champagne.

All vines are liable to certain pests, such as *Oïdium*, *Phylloxera*, and others; but in Champagne there are dangers peculiar to the locality which the vine-grower has specially to combat. In the first place, owing to the northern latitude of the Champagne district, the quantity of solar heat from which the plant can annually derive benefit is very small as compared with that which prevails in more southern districts. Therefore, a special mode of cultivation is necessary in order to bring the grapes to a satisfactory degree of maturity. The method now universally adopted is to keep the grapes as close as possible to the arid soil, which thus during the night exhales on the fruit the solar heat which it had absorbed during the day.

In order to ensure the success of this practice, the vines are pruned very hard, only two eyes being left, and every year the main stem is a little more covered with earth by the spade, so that only a small portion of old wood is left projecting above the ground.

From time to time it is necessary to fill up gaps caused by the decay of old plants. This is done by a process of layering to a depth of 9 or 10 inches, not only old wood but also a certain number of eyes on the wood of the year. The layer is covered by a mixture of earth and manure, and thus grows with considerable vigour, giving not only a good crop in the course of a short time, but also furnishing slips which may be used to fill up other gaps.

This practice is not unattended with inconveniences. In the first place, to ensure the success of the layering it is necessary to select vigorous plants which have strong shoots; and as the layering cannot be done at a very great distance from the parent plant, and often at very variable distances, the lines of vines become gradually more or less confused, and the proper cultivation and cleaning of the vineyard more difficult and expensive.

During recent years many experiments have been made to preserve the lines of vines, with the triple object of being able to use movable means of protection against spring frosts, to use a horse-hoe and thus reduce the cost of successive hand-hoeings, and finally to enable the vines to be periodically manured in their turn. This mode of cultivation is pursued in most of the vine-growing districts of France, and it has the undeniable advantage of admitting more sun, more light, and more air to the plants. Nevertheless, in Champagne as almost everywhere, any innovation upon ancient usages is sure to be condemned by the majority, who are wedded to old practices, without giving a new idea a fair trial. At the same time, it must be observed that the small vine-growers, who require no extraneous labour, work with great industry and intelligence in their vineyards, and it is not yet absolutely proved that the new system produces as much wine of better quality as the old one, or even more wine of the same quality.

The work of the year may be briefly described as follows:—After the vintage, which generally occupies from the first of September to the middle of October, the stakes to which the vines are tied are pulled up and stacked in the vineyards. In winter the ground is dug all over, or in those places where it seems most to require it. Some caution is requisite, for although the digging assists in destroying insects, which are then buried in the ground, on the other hand it hastens the coming of the vine into leaf in the spring, and thus exposes it more to the destructive effects of spring frosts. In February, or, still better, in March, the vine is pruned, layering is done if required; the land is hoed and cleaned, and the stakes are replaced; but the vines are not then tied to them. When the vines are sufficiently in leaf, but before they are in flower, they are tied to the stakes—generally about the beginning of June. Afterwards, the useless slips are cut off, and those branches which have grown too vigorously are pruned down to about 20 inches. This pruning is repeated several times according to the luxuriance of the growth of the vine. However much these prunings may weaken the plant and diminish the crop, they are absolutely necessary, under the general system of planting, to enable the sun's rays to penetrate to and ripen the fruit, more especially the bunches near the ground. Several hoeings are also necessary to destroy weeds, which in the light and poor soils of Champagne are very detrimental to the vintage.

For making new vineyards, the ends of the pruned branches are planted in a slanting position in February or March, at the time of pruning, in a nursery-bed, and grown there for two or three years with the special object of enabling the plants to acquire a good development of root. For this purpose they are pruned down every year, so as to leave two or at most three eyes of the last year's wood. The fruit comes on the new wood of the same year, but it is generally five years before a vine is allowed to come into bearing.

An acre of vineyard of a good quality will produce generally from 130 to 160 gallons of marketable wine, but sometimes a much larger quantity, and occasionally almost nothing.

An ordinary peasant proprietor with his family can manage between 3 and 4 acres without hired labour, but the peasants do not often possess so large an extent of land. Owing to the high price of everything, especially food, lodging, and manure, and the burden of rates and taxes, it is reckoned that to pay his way the peasant should be able to sell his produce for at least 100*l.* per annum. The lowest possible return from one hectare (2½ acres), which will enable this balance of receipts and expenditure to be arrived at, is therefore between 64*l.* and 68*l.*, or say 26*l.* per acre. The large proprietor requires a somewhat larger return to make his vineyard pay, because during times of pressure, when there is considerable competition for hired labour, he is obliged to engage occasional labourers at a very high rate. On the other hand, it should be remembered that many of these larger estates represent the first quality (*premiers crus*) of Champagne, and that their produce is often sold at the rate of 800*l.* per acre, and generally exceeds 300*l.* per acre. These prices leave a very wide margin for additional expenditure on labour and other items necessary to the production of the best quality of wine. The vineyards are usually the property of the cultivator, being seldom let except during an interval previous to sale, and then the rent paid is usually half the gross produce.

Saumur.—Nothing can be more striking than the contrast between the vineyards of the two great districts where sparkling wine is the speciality. Instead of the hill sides covered with short closely-planted vines that one sees in Champagne, the vines of Saumur appear at first sight to be neither more nor less than hedgerows, separating the fields of corn and clover, and trained to stakes, sometimes connected by iron wire. There are, however, some vineyards entirely devoted to the grape, and there the usual course of cultivation, as I was informed, by Mr. Akerman Laurance, of St. Laurent, near Saumur, is briefly as follows:—

The ground having been thoroughly well cultivated, during the autumn and early spring, the vines are planted in March. The sets are cuttings taken in November, and they are planted deeper in sandy ground than in heavier soil, the rows being 6 feet 6 inches apart and the plants 33 inches distant in the rows. Manuring is done in various ways. It is considered best to apply manure only once in ten years, but some farmers manure every four years and others again every year. Frequent manure is condemned by those who should be the best judges. There is also an idea that cattle-dung is the best manure for sandy soil and stable-manure for richer soil. Sometimes, also, guano is used. The land is either dug or ploughed three or four times during the growing season, to keep it free from weeds, and pruning is done at the beginning of June. As in Champagne so in the Saumur district, the vines on the hill-sides and on chalky soils give the best wine, and those in the valleys and on flat land produce what are termed "small wines" (*petits vins*). Farms which produce from 50 to 100 casks a year are the most numerous in this district, but there are many which have an average vintage of 300 or 400 casks. The merchants buy the "must" of the farmers, generally having a contract with them for a number of years at so much per hogshead.

Cognac.—A few words on this district, which is of almost as much interest to Englishmen as the Champagne, will enable me to mention that fearful scourge, the *Phylloxera.* The vines are grown on an intermediate system to those prevailing in Champagne and Saumur. They are planted in rows about a yard apart, but not many rows together without an interval cropped as agricultural land. The land is manured for the farm-crops, but the vines are not specially manured, as they are thought to obtain sufficient nutriment from the manure applied to the adjacent crops. The cultivation of the land, except hand-hoeing, is done by means of an ancient lumbering machine like a one-tined cultivator, drawn by two bullocks.

The ordinary course of cropping is the national three-shift rotation, namely, two white crops followed by green crops, potatoes, or bare fallow. Wheat often succeeds wheat on the stronger land, where, of course, no vines are grown. About 50 acres is the prevailing size of the farms, which are worked generally on the *métayer* system (that is to say, the farmer receives half the produce as payment for labour and supervision, and the landlord receives the other half as payment for rent, interest on capital, manure, and other expenses). Vine-lands are generally cultivated by the proprietors. The farmers distil their own wine at the farm-houses, without the supervision of a custom-house officer, but they must obtain a permit to move it. The duty is paid when the brandy is sold to the retail dealer, or when it is shipped for export. The export duty is light, but the duty for home consumption is very heavy.

The great question in the Cognac district, which comprises nearly the whole of the two Departments of the Charente, is, "How to prevent in future the ravages of the Phylloxera?" Up to the end of 1878 about one-third of the acreage in vines in the two Departments had been utterly ruined. In consequence, so I was informed, the value of vineyard property had been so depreciated that in some districts it was entirely unsaleable: in fact, nobody attempted to sell real estate. However, thanks to the frugality of the farmers, which in this district took the form of hoarding brandy instead of coin, it was estimated that the markets could be supplied with more or less matured brandy for at least seven or eight years from these hoards. It is the practice of the farmers to reserve a portion of each year's make, and to sell it by degrees, after a sufficient lapse of time, at a high price. Buying pure brandy has, however, become somewhat difficult, even to experts, because the farmers have learned to adulterate the grape-spirit with beet-root spirit and essences. Years ago such practices were never attempted, but are now common.

The best district for Cognac is on the side of the Charente, opposite the town of Jarnac, yet not in the true valley of the Charente, but in the next valley but one farther south. This is the real home of the "Fin Champagne." Very good brandy is obtained in the neighbouring valleys, but this one bears the palm. The ordinary qualities of Cognac are produced by blending the spirit produced in the several valleys on the Jarnac side in various proportions; and the manner in which this is done by each "house" is a secret most jealously preserved. A small quantity of syrup made from the finest white crystalized sugar is added.

Such is a brief sketch of the vine-culture and brandy production in the two Departments of the Charente—a fair district, whose vineyards are being rapidly rendered desolate by a microscopic insect related to the common plant-louse. The French Government has appointed Commissions to investigate the subject; individual men of science have studied the question from almost every point of view; experiments, both preventive and curative, have been tried; but up to the present time the Phylloxera, like the potato-disease, has defied every effort suggested by science and every device prompted by human ingenuity.

I should add, that M. E. Martell, of Cognac, and M. Hine, of Jarnac, gave me every facility to investigate this district. It would be presumption for me to attempt to enter into the Phylloxera question; but, without reference to that insect pest, I may perhaps be allowed to say that vegetable pests might be much less rampant in the district than they are at present, if greater attention and improved implements were applied to the cultivation of the soil.

III.—*The Supply of Milk to Labourers.* By HENRY EVERSHED.

DURING my inquiries last year, when engaged in preparing a paper on 'Cow Keeping by Farm Labourers' which appeared in the last number of the 'Journal,' numerous correspondents, from all parts of the country, complained of the difficulty which labourers and others experience in obtaining milk for their families. That milk is the best and most complete food for children and young people no one will dispute. Many of my correspondents have given their opinion derived from personal observation, that milk is indispensable for the proper rearing of families; and that the labouring classes, both in town and country, are liable to deterioration from the want of milk for their children. It would be easy to supply copious medical evidence to the same effect, but it would be out of place.

In this short paper I propose to show, from a practical point of view, the value of milk as an article of diet, its scarcity, and the methods by which it might be rendered more abundant. Instead of collecting medical opinions I propose to quote Mr. Snowball, the Duke of Northumberland's Commissioner in the North. He says:—

> "I have always attributed the superiority of power and intellect in the Northumberland farm labourers to the food they receive in early life. Their parents had a cow, kept a certain quantity of wheat, barley, oats, and pease as part of their wages, with also about 1000 yards of potatoes planted, from which the most wholesome food was obtained for their sustenance, but after the tariff by which tea, coffee, sugar, &c., were reduced in price, a disposition grew against payment of wages in kind; and the payment in corn and the keeping of a cow is the exception instead of the rule, which I much regret."

Even in the North a change in the method of payments is leading, for the present at least, to the diminished use of milk. In the North, however, the milk question, as it affects farm labourers, is very much less urgent than in the south. The "family system" still prevails, and the young labourers, living in the farm-houses, get their basins of hot milk morning and night. Mr. Joseph Culshaw, Townley, Lancashire, informs me that the labourers in his neighbourhood do not keep cows, and the young men lodge in the farm-houses.

Colonel Kingscote, the late President of the Society, resides in a locality incorrigibly arable, on the Cotswold hills, where the large farms of 500 or 600 acres have hardly sufficient pasture for the maintenance of two or three cows on each farm, and where little milk is obtainable by either farmers or labourers. I venture to quote the following paragraph from a letter of Colonel Kingscote's, on the importance of the milk supply generally:—

> "I think every employer of farm-labour should sell milk to the labourer at as cheap a rate as he can, in proportion to the number of the family, as I do in my own case."

Mr. John Treadwell, Upper Winchendon, has communicated the following information from the Vale of Aylesbury:—

> "In this district the practice is to give all the cattle- and stock-men and boys (where a butter-dairy is kept) a good basin of hot milk for breakfast, and if there is any illness the farmers never refuse a can of milk. Since milk-selling has become more prominent, I think that in many instances the stockmen get coffee or beer for breakfast instead of milk."

Mr. R. Neville, Butleigh Court, Glastonbury, gives an unusually satisfactory account of the milk supply in his neighbourhood. He says:—

> "This is a regular dairy country; the labourers generally get milk and butter from their employers at a fair market price. I sell skim-milk at ½*d.* per quart to all who like to fetch it, and bring the money with them; about twenty daily are thus supplied."

And as skim-milk has lost none of its nitrogenous elements, Mr. Neville's neighbours are supplied with a very valuable article of food at a very low price. The labourers of Liphook referred to by Sir A. Macdonald, are quite mistaken as to the comparative value of new and of skim milk.

Sir A. Macdonald, writing from Woolmer, Liphook, says that milk is not very readily attainable in that neighbourhood.

> "The farm-labourers appear to consider milk *necessary* only for young children, and for that purpose they purchase *new milk* at 2*d.* per pint, in preference to skim-milk *gratis.*
>
> "In answer to inquiries, I am told by the labourers that they *prefer* their tea or coffee without milk."

Mr. W. Frankish, Limber, Ulceby, Lincolnshire, describes his district as partially supplied either by cottage cow-keepers or small farmers, or by those larger ones who sometimes sell milk at a nominal charge to the labourers. I have now quoted several cases of an unusual character; but so much evidence of the shortness of the milk supply comes from so many correspondents in various parts of the country, that it is impossible to doubt it. Those who do not meet with the difficulty of obtaining milk at a poor man's price may be assured that their place of residence is highly favoured. Lord Vernon says:—

> "In the dairy districts of Derbyshire the labourer has great difficulty in obtaining milk."

Mr. Charles Howard writes from Biddenham:—

> "Milk is not available in many villages to the extent that is desirable. A supply of good skim-milk would be a great boon to men with large families, and it might be managed without much trouble or inconvenience on most farms."

Mr. Howard adds a hint which I cannot forbear quoting. He says:—

> "In this village we have some four or five small holdings, varying from 5 to 10 acres, on each of which some two or three cows are kept; formerly the milk was made into butter, but as the population of Bedford has increased, these cottagers sell their milk to go there, being only a short distance from the town. Some of these holdings are occupied by men who have been thrifty, industrious labourers. I consider they have a beneficial effect: they

are an incentive to thrift and good conduct, as none are promoted to them unless they have conducted themselves respectably."

Mr. Henry A. Bottle writes from Patenhall, Kimbolton, Beds, of the general need in his neighbourhood that milk should be more accessible to the working classes.

Mr. James Howard shows how he has dealt with the milk question in the Village of Clapham, near Bedford, in the following words:—

"Owing to the difficulty the people in this village had in obtaining milk, I set up a hand-cart, which cost five guineas, the can holding 15 gallons. After the morning milking is over, the milkman goes the round of the village with the cart; the journey takes about 1½ to 2 hours. The milk is skimmed once or twice according to the weather, and the charge made is 1*d.* per quart. Those who prefer new milk get it at the dairy, for which they pay 4*d.* per quart. Nothing is sent out on Sundays, but an extra journey is made on Saturday afternoon. The villagers are very thankful for the accommodation, and the man has never had the least trouble about payment. I think the difficulty in getting milk in villages is very general and has become a crying evil."

The Hon. Wilbraham Egerton, M.P., Rosthern Manor, Knutsford, has favoured me with the following plan for overcoming the milk difficulty, which has been adopted in his neighbourhood:—

"A field of 12 acres, called the Church Field, and close to the church, in the village of Rosthern, is let to six of the inhabitants of the village for cow-pasturage at the annual rent of 3*l.* per cow, on condition that any milk not required by the family of the owner of the cow shall be sold to the villagers. This arrangement answers very well; and besides this arrangement the schoolmaster living in the village has a small farm of 12 acres, and keeps three or four cows, and supplies his family and some of the villagers with milk."

Mr. Egerton adds, on the subject of condensed milk:—

"The tins of condensed milk are quite available and an excellent substitute for milk. Having visited the manufactory at Middlewick in Cheshire, I can testify to the admirable way in which the watery particles of the milk are evaporated; and nothing remains to be done but to restore the water to the condensed milk for use."

Before considering in further detail the methods for increasing the milk supply, it will be desirable to compare its value with that of other food, and thus to ascertain the price which farm-labourers should be willing to pay for it. On this part of my subject I shall be guided partly by the evidence contained in Dr. Pavy's 'Treatise on Food and Dietetics,' and on the table of analysis in Dr. Letheby's work on 'Food.'

The following analyses are taken from Dr. Letheby's work on Food:—

COMPOSITION of MEATS.

	Lean Beef.	Fat Beef.	Lean Mutton.	Fat Mutton.	Dried Bacon.	Fat Pork.
Nitrogenous matter	19·3	14·8	18·3	12·4	8·8	9·8
Fat	3·6	29·8	4·9	31·1	73·3	48·9
Saline matter	5·1	4·4	4·8	3·5	2·9	2·3
Water	72·0	51·0	72·0	53.0	15·0	39·0
	100·0	100–0	100·0	100·0	100·0	100·0

COMPOSITION of MILK AND CHEESE.

	Cheddar Cheese.	Cow's Milk.	Skimmed Milk.
Nitrogenous matter	28·4	4·1	4·1
Fatty matter	31·1	3·9	0·7
Lactine	..	5·2	6·4
Saline matter	4·5	0·8	0·8
Water	36·0	86·0	88·0
	100·0	100·0	100·0

COMPOSITION of FARINACEOUS FOODS.

	Bread.	Potato.	Oatmeal.	Wheaten Flour.
Nitrogenous matter	8·1	2·1	12·6	10·8
Carbo-hydrates	51·4	..	63·8	70·5
Starch	..	18·8	..	..
Sugar	..	3·2	..	..
Fatty matter	1.6	0·2	5·6	2·0
Saline matter	..	0·7	3·0	..
Mineral matter	2·3	..	..	1·7
Water	37·0	75·0	15·0	15·0
	100·0	100·0	100·0	100·0

Dr. Pavy gives an experimental determination by Professor Frankland of the force-producing power of various articles in common use as food. "The results of experience," says Dr. Pavy, "fully accord with the teachings of science. In the case of navvies and other hard-working men the appetite is known by the employer to form a measure of capacity for work. A farmer, where wages were good, when asked, how it was that he paid his labourers so well? replied that he could not afford to pay them less, for he found that less wages produced less work."

Looking at my subject from this point of view, it is essential to know what constitutes a good diet, and what is the comparative position of milk among the different kinds of food. "Practically," continues Dr. Pavy, after further remarks on the theory of nutrition and the respective values of the two groups of alimentary substances, nitrogenous and non-nitrogenous, 'it is found that hard work is best performed under a liberal supply of nitrogen-containing food. The reason probably is that it leads to a better nourished condition of the muscles and of the body generally. Under the use of animal food which is characterised by its richness in nitrogenous matter, the muscles, it is affirmed, are observed to be firmer and richer in solid constituents than under subsistence upon food of a vegetable nature." I must refer the reader to Dr. Pavy's elaborate work for further information on the value of different kinds of food, and to Dr. Parkes's popular manual on the 'Personal Care of Health,' for some excellent practical suggestions on the same subject. The evidence collected by Dr. Pavy all tends to establish that "practically," to quote his expression, we may take the amount of the nitrogenous elements in food as the test of its value to labouring men, with some deduction in the case of milk, compared with some other articles, on account of its larger percentage of water and its poverty in the carbonaceous elements.

The analyses of different kinds of food will, at least, enable us to draw a few broad conclusions as to their respective value. A pound of uncooked beef, for example, contains four times as much nitrogenous matter as a pint of milk, and it costs in London about four times as much—the price of beef being 10*d.* per lb. and of milk 2½*d.* per pint. The necessities of the labourer's pocket, however, direct him to the purchase of less costly food. He obtains in a pound of cheese seven times as much nitrogenous matter and nearly eight times as much fatty matter as in a pound, or pint, of milk. In bread he obtains nearly twice as much nitrogenous matter and a large supply of carbonaceous substances. In dried bacon and fat pork he obtains twice as much nitrogenous matter and a very large supply of fat.

In the works of Dr. Pavy, Dr. Parkes, and Dr. Playfair a number of dietaries suited to men under various circumstances, whether engaged in laborious or light work, are given. A typical dietary for a labouring man is 2 lbs. of bread and ¾ lb. of uncooked lean beef daily, supplying—

	oz.
Nitrogenous matter	4·908
Fat..	0·944
Carbo-hydrates	16·320
Mineral matter	1·348
	23·520

In the case of the farm labourer in the south of England the meat is eliminated from his dietary, and cheese and bacon are substituted. There can be no doubt that experience is the labourer's best guide, and, guided by experience, he will not be likely, I think, to become a consumer of milk costing more than about 1*d.* per pint.

It is the loss of milk which has led to the disuse of porridge, which consists of two cheap and excellent raw materials blended together, and the substitution of the various manufactured articles, from bread to bacon. The gain to the labourer from using food in its simpler forms is evident. The cost of flour at the Co-operative Stores now is rather less than 2*d.* per pound, and that of oatmeal is 2*d.* Bread, on the contrary, a manufactured article, which may be adulterated, contains 25 per cent. of water at the best (one sack of flour, 280 lbs. = 95 four-pound loaves), and its price now is nearly 2*d.* per pound, or about the same as that of oatmeal or of flour.

Dr. Parkes has some remarks on the value of *meal*, which are by no means irrelevant to my subject, if I am correct in the opinion that the recovery of a cheap supply of milk would lead to the restoration of "meal" as an article of diet. He says: "It is indeed surprising to see how oatmeal, the most nutritive of the cereal grains, and formerly the staple food of our finest men, is now neglected."

One and a quarter pound of oatmeal, says Dr. Parkes, will supply as much nitrogen, and almost as much fat to the body, as 1 lb. of uncooked meat of ordinary quality. A man gets quite three times as much nourishment at the same cost in oatmeal as in meat, and the oatmeal is more cheaply cooked. Indian corn (maize) is even cheaper, and 1½ lb. of maize is equal to 1 lb. of uncooked meat in nitrogen, and surpasses it in fat. Bean- and pea-meal are still richer in nitrogen, and, as Dr. Parkes remarks, are far less used by our labouring classes than they should be; but even the schools of cookery and better teaching on the subject of diet will fail in restoring or originating the use of the various kinds of meal, unless the milk which seems naturally to go with them in cooking is forthcoming.

Dr. Parkes might have mentioned that hominy porridge—Indian corn ground roughly, boiled, and eaten with milk and sugar—is the staple breakfast of the United States, and that the labouring classes highly appreciate that kind of "spoon-meat." He concludes his observations on the meal of cereals with an account of an experiment on the value of oatmeal and milk. "I kept a strong soldier, thirty years of age, and weighing 10½ stone, and doing hard work, on oatmeal and milk alone, and found that he was kept in perfect health, and at a constant weight, by 1¾ lb. of oatmeal and 2 pints of milk." The man was sorry, says Dr. Parkes, to return to his soldier's rations of bread, butter, meat and potatoes, &c. He mentions these facts to show "how, with the present price of meat, a man may live better and cheaper on other foods." Yes; but it cannot be done without milk. A Scotch ploughman's daily allowance is 2½ lbs. of oatmeal and 1 pint of milk. The milk costs little; but Dr. Parkes paid for the soldier's 2 pints of milk 4*d.*, or 5*s.* 3*d.* a week, meal included; and, cheap as the meal may be, such a price for milk places the meal and milk diet quite beyond the reach of the labouring man.

I believe that milk might be supplied in most districts at 1*d.* per pint. It is true that the prices of agricultural produce are at the present time somewhat unsettled, and that lower prices than those of the past twenty years for meat, and wheat, and cheese, are generally anticipated. Land hitherto devoted to these articles will probably be set free for the more perishable products, and it may prove in the future advantageous to develop such a milk trade throughout the country as its consumption by the labouring classes would occasion. The price of milk has risen with that of meat. According to the Parliamentary Returns relating to grain and other agricultural produce, obtained on the motion of Mr. Bass, and printed in 1879, the price of milk delivered at Bethlehem Hospital from 1846 to 1856, ranged between 7*d.* and 11*d.* per gallon; from 1856 to 1866 its price was 9*d.*, 9½*d.*, and 10*d.* per gallon; and in the last two years 1*s.* and 1*s.* 1*d.* The price then stood at 1*s.* until 1874, when it rose to 1*s.* 3*d.*, at which it has remained. It may be anticipated that the price of milk must fall with that of meat and cheese; but it is unlikely that it will come generally within the labourer's reach as an article of diet on the existing system of milk production.

The following is a suggestion by a practical man, and I may say here that whether the difficulties of the milk supply are removed by co-operative farms or not, they can only be solved, I think, by small farms widely scattered over the country. In Scotland and the North the milk is consumed on the very spot where it is produced, and this was the case in the South, when farm-servants lived in farmhouses, and bread and milk, with pork or bacon, formed their morning and evening meals.

Mr. G. H. May, Elford Park, Tamworth, tells me that his farm, of 435 acres, with not a cottage on or near it, is equidistant from two villages, each containing 500 inhabitants. In one, new milk can be obtained in limited quantities; in the other, to quote one of Mr. May's men: "Nothing but skim, sir, which is very often a good deal like water. My children do not know the taste of new milk." Mr. May has taken counsel with his men on the subject of the milk supply, and they have come to the conclusion that if half-a-dozen holdings, of from 4 to 6 acres were arranged in each village, with suitable buildings, so that 1 or 2 cows could be kept in each, on the understanding that new milk was to be supplied under arrangement, it would answer. This plan would entail unavoidable expense in the re-arrangement of farms and erection of buildings. A simpler plan would be, Mr. May thinks,

> "a small co-operative milk farm, say from 20 to 30 acres, sufficient ground being apportioned for grazing and mowing, and enough in arable for roots and straw. A portion of the arable might be let off as allotments annually, and so all the arable might be cultivated by spare labour. Of course a good man and his wife would be wanted as managers, and capital would be needed from some source at starting. A simpler plan would be for a landlord, on letting his home farm or the one lying most convenient for the purpose, to arrange with his tenant to supply a certain quantity of new milk (say at union-contract prices) to the labourers' families.
>
> "'The shoemaker's children are badly shod,' applies to this milk business. Who that looks on a poor rickety child (and there are many) does not wish that it had food as nourishing as a calf or lamb."

Other correspondents have also spoken favourably of small farms, and among them Mr. H. W. Keary, of Bridgenorth, agent to Lord Vernon. He is in favour of some small holdings, four or five acres in extent, on every large estate, occupied by steady labourers. In his district in Derbyshire the produce of three small dairy-farms is nearly all made into cheese or butter. The buildings are a small cow-house for two cows, and pig-sty for two pigs, erected at a cost of 50*l.* The small farms answer well, Mr. Keary says, in the case of small village tradesmen with a little capital, whose houses generally possess sufficient accommodation for dairying purposes.

I think that Mr. May and Mr. Keary have hit upon the true principle of developing the milk supply. It must be done by small farmers. I have never seen the small-farm system better carried out in a large farm district than on Lord Hill's estate, Hawkstone, Shropshire, and a letter from Mr. E. Haste, the agent, shows that the single cow of a farm labourer may be a good stepping stone to a small farm. Mr. Haste writes:—

> "The labourers, by having small holdings, have not so much time to spend at the beer-houses, and many are now saving money, and hope in a few years to occupy larger holdings.
>
> "The family also—children—being accustomed to help in attending to the cow and cultivating the land, make better servants and workmen than the children of labourers who have not these advantages."

Unfortunately the breed of small farmers has been lost, and cannot be recovered in a day. Mr. Gilbert Murray, Elvaston, Derby, has favoured me with an interesting communication on the ignorance of dairying and the educational effects of cow-keeping. It would cultivate in the labourer, Mr. Murray thinks, the virtue of more settled habits, increase his interest in and attachment to the soil, and afford an early industrial training to the children. "Unfortunately," Mr. Murray adds, "the majority of the wives of agricultural labourers in the midland counties cannot even milk a cow, and are perfectly ignorant of the simplest details of dairy management." Mr. Murray, however, has the agency of an estate on which there are a number of small "takes" of from two to six acres. Many of the occupiers are not constant agricultural labourers, though they assist at busy seasons. The families consume the skim-milk and a part of the butter; the butter-milk is used for pig-feeding. At the present time some of these small holders are selling all the milk. The buildings are wooden home-built erections, costing 10*l.* for sufficient accommodation for one cow and a calf. As the interest in small holdings is reviving, I will quote Mr. Murray on the subject. He says:—

> "When fully established on an estate they would be a strong incentive to young labourers and servants of both sexes to lay by their slender savings, with which on marriage to set up housekeeping, and eventually become the owners of cows. This is the class to encourage. A young man with a rising family would be more benefited than one whose family were grown up and gone away. As already stated, the great obstacle is the absence of skill and experience in the wife of the labourer."

As an expedient for providing milk for children in certain districts, it may be proper for large farmers and proprietors to supply it at a low price to their labourers' families; but milk will never be supplied generally as a matter of favour at less than the market price, so as to render it an article of common consumption. Nor do I think that milk can be supplied generally by large farmers at a consuming price without loss, owing to the cost attending the distribution. That awkward item, labour, forms a considerable part of the price of milk everywhere except at the very spot where the cow is milked. I believe that the distribution of milk in London, after its arrival, costs 1*d.* per quart; and as the producer receives 2*d.* per quart, it cannot be sold at less than 4*d.*; so that the cost of distribution amounts to 25 per cent. of the retail price.

It is evident that milk could not be delivered at the cottages, even in a dairy district, without a considerable addition to the cost of the article compared with what it cost the farmer when it formed part of the diet of his labourers living in his house. Nor can it, as a rule, be fetched from the dairies without a similar enhancement of price. Unless, therefore, milk for general consumption among labourers is supplied as a favour—and it seems to me that wages might as well be raised as a favour—I am afraid that its use as an article of daily diet has become impracticable under existing circumstances.

To sum up the conclusions formed on the evidence brought forward in these pages, the use of milk has been abandoned by labourers chiefly from the difficulty of obtaining it, and partly owing to a fashion for the so-called substitutes, tea, coffee, and beer. Notwithstanding all the medical evidence bearing on the subject, and the popular as well as learned treatises on diet, the care of health, and the rearing of families, fashions and customs still prevail in direct opposition to common sense and the doctors. What has happened in the class above them has happened to farm-labourers—their new methods of dieting the young are inferior to the old ones. Owing to the difficulty of obtaining milk in towns, how many children, even among the middle class, have been improperly fed for the want of it? It would be an error, therefore, to conclude, from a spirit of mere optimism, that the fact of milk having gone out of use in country districts shows that it must have been supplanted by other foods of equal or superior value. That cannot be the case, so far as the young are concerned, since milk is known to be the only perfect food for them.

If milk were rendered available at a cheap rate, the experience of its value would overcome all existing prejudices, and bring it once more into general use. The remedy for the present scarcity lies in the multiplication of small dairies, and, as the particular remedy which I fully described in the article on "Cow-keeping by Farm Labourers" is only capable of limited application, such small dairies, as several of my correspondents have referred to, might be encouraged with great advantage. It has sometimes been asserted that such dairies would everywhere spring up, if their produce were in demand. This, however, hardly meets the existing difficulty, for unless proprietors are assured of the importance of the small dairies, the land will not be easily obtained. A man who might desire to invest his savings in the way suggested cannot do so unless the land and the buildings are forthcoming, and it is not every land-agent who would manage and collect the rents for numerous small tenants so willingly as Mr. Haste and some others may do.

It follows that in many cases the small capitalist might offer good interest on the necessary outlay on buildings, and he would still be refused the small dairy farm which he desired. The immediate increase of the milk-supply, therefore, seems to me to depend, in great measure, on the co-operation of proprietors with small farmers, which will probably not be withheld when the importance of the subject is understood.

IV.—*Underwood: the Planting, Growth, Conversion, and Sale thereof.* By FRANCIS TALLANT, of Easebourne.

SUSSEX is the home of the woodman. Ancient writers inform us that this county was a forest before the Norman Conquest. By the latest returns the woodland in Sussex is estimated at 101,331 acres, exclusive of commons, gorse lands, and garden shrubberies. The Cowdray Estate, the property of the Earl of Egmont, comprising several thousand acres of woodland, from which 350 acres of underwood are sold yearly by auction, fairly represents the trade in underwood.

Commencing with a large tract of woodland on the chalk of the South Downs, where the estates of the noble owners of Goodwood, Cowdray, and Petworth meet, the underwood consists chiefly of hazel, ash, birch, maple, hornbeam, rough oak, and beech, with some beautiful specimens of the spindle and dogwood. The cuttings vary from ten to thirteen years apart. The produce is chiefly converted into wattled sheep-hurdles and sheep-cages; ash, into hoops for the London market. Little is done in the way of renovating these woodlands. I have planted ash to fill up weak places, but after ten years' growth the plants have not been larger than walking-sticks. For renovating woods on the Downs, holes dug 18 inches square and 12 inches deep cost 1*s.* 8*d.* per 100. It is, however, difficult to get uniform depth on these flinty soils. Ash is indigenous to the Downs, and plants of natural growth run away from those the woodman may plant. Wattled sheep-hurdles on the Downs are sold at 9*s.* to 10*s.* per dozen; sheep-cages for hay, 2*s.* each, 21*s.* per dozen: the same with beech bottoms for chaff and corn, 4*s.* 6*d.* each.

The monotony of the copse-cutter's work on the Downs is varied by the conversion of the spindle (*Euonymus europæus*) and dogwood (*Cornus sanguinea*), from which butchers' skewers, pegs for shoes, spindles, small handles, &c., are made from these underwoods. They also furnish the finest charcoal, "much approved by artists for its smoothness and the ease with which it can be erased."

I now come to the Greensand formation, a lower range of hills between Midhurst and Haslemere. On these hills and the lands adjoining are valuable plantations of Spanish chestnut and ash, with a little birch and hazel. The soil is chiefly sandy loam from 4 to 12 inches deep, resting on greensand. The drainage is natural, but the hills abound in springs. It is therefore necessary to provide watercourses against heavy thunderstorms or incessant rain. The earliest age at which these underwoods are cut is eight years. Some are cut at nine years' growth. The process of planting chestnut, ash, or mixed coppice, may be here explained. I select a piece of land not worth more than 10*s*. per acre for farm culture. If the soil is very poor I plant 3 feet, on better soil 3 feet 6 inches apart, each way. Holes 18 inches square, 12 inches deep where the rock will allow, cost 1*s*. per 100. Planting costs 1*s*. per 100; on stiffer soil or stony land, 1*s*. 3*d*. per 100. At 3 feet apart, 4840 plants per acre are required; at 3½ feet apart, 3556 per acre. The plants should be well rooted and have been transplanted in the nursery. Chestnut plants from 30 inches to 42 inches high cost from 30*s*. to 35*s*. per 1000; ash 3 to 5 feet, 30*s*.; birch ditto, 27*s*. 6*d*.; willow ditto, 25*s*.; alder ditto, 30*s*.; hazel ditto, 25*s*. I prefer plants 3 feet high to larger. For three seasons after planting, the coarse weeds and briars are cut down between the rows in the young plantation. After the fourth year's growth I cut the plants down to the stem; in the following autumn I replace dead plants. The coppice now goes ahead for nine years, when it is put to auction and will probably fetch 12*l*. per acre. Nine years afterwards the same should realise 18*l*. per acre; whilst after the third period of nine years, if the coppice has thriven, the return may be as much as 28*l*. per acre. The coppice is no further trouble after the first cutting, excepting that necessary to replenish dead stools, for which 200 plants per acre will suffice. Another way of renewing plants on light soils is to lay plashers, cutting them three parts through at the stem and covering with soil all but two joints. Trees must not be encouraged nor rabbits tolerated if first-class underwood is desired. I have found no advantage in trenching for planting.

The following result of planting nine acres of land of the quality described is taken from the Cowdray Estate books:—"Iron Hill Field, in parishes of Fernhurst and Woolbeding, 9 a. 0 r. 18 p.—planted with all chestnut in 1835. Plants cut off in 1840. In 1849, at nine years' growth, sold by auction at 14*l*. 10*s*. per acre.

In 1858 at 9 years' growth, 18*l*. 15*s*. per acre.
„ 1868 at 10 years' ditto, 35*l*. 0*s*. „ „
„ 1876 at 8 years' ditto, 30*l*. 15*s*. „ „ "

As, however, this underwood is of superior quality, I cannot quote these figures as representing the average of a planted coppice.

In the Weald of Sussex I have to deal with clay and water. Ditches and watercourses must be kept well open, and drainage as perfectly as the nature of the ground will allow. Here I plant chestnut and ash alternately. In swampy places I plant alder for powder merchants. Willow is rarely planted, as there is no basket-making in this neighbourhood. The willow is allowed to grow eight or nine years, and is chiefly converted for powderwood. Underwood rejoices in sunshine, and suffers in cold sunless seasons. In 1878 I measured the following "first shoot" in various plantations: chestnut, 7 feet to 8 feet 6 inches; ash, 8 feet to 10 feet; birch, 7 feet to 8 feet 7 inches; alder, 7 feet 2 inches; hazel, 6 feet 3 inches; willow, 8 feet 6 inches to 11 feet. In the wet season of 1860, and the still worse season of 1879, the first shoot rarely reached 24 inches, and in much woodland not 12 inches. Late spring frosts are very injurious to chestnut shoots. A frost in May occasionally destroys a summer's growth. Landowners who prefer to cut their own underwood may wish to know the cost of labour for converting the stuff, and the value of the manufactured article. I therefore give particulars of the chief productions. The year 1877 is selected as being a fair average for labour and value of goods. In Sussex the best chestnut and ash are worked up for hoops; the rough poles are sold to the hop-growers.

Hoop chips were formerly used for thatching farm-buildings and cottages. The old skilled thatchers have died off, and young men are not found who can execute the work equally well, so the picturesque cottage thatched with chips is replaced by a roof covered with tiles or slates, and the chips are sold for firing.

Prices paid for Coppice-cutting in 1877.

	s.	*d.*	
Cutting hoops, at per load of 30 bundles	8	6	per load.
Hop-poles	1	3	per hundred, all lengths.
Short fagots	3	6	"
Clean bavins	2	3	"
Bush bavins	2	3	"
Broom-sticks	0	4	"
Bean-sticks	0	4	"
Broom-bands	0	4	"
Hooked stakes	0	4	"
Walking-sticks	0	8	"
Spar timber	0	3	"
Pea-sticks	0	0¾	per bundle.
Withes	0	2½	per hundred.

Cutting and stripping alder and willow for powderwood, 10*s.* per load piled, 24 feet long, in 3 feet lengths 2 feet high.

Making wattled sheep-hurdles in the Weald, of hazel, 3*s.* 9*d.* per dozen.

Sale Prices in the Coppices.

	s.	*d.*	
16-feet hop-poles	15	0	per hundred or bundle.
14-feet „	12	0	„
12-feet hop-poles	9	0	„
10-feet „	5	0	„
Short fagots	9	0	„
Clean bavins	5	0	„
Bush „	2	6	„
Broom-sticks	1	0	„
Bean-sticks	1	2	„
Broom-bands	1	0	„
Hooked stakes	1	2	„
Walking-sticks	2	0	per gross.
Spar timber	0	9	per hundred or bundle.
Pea-sticks	0	2	„
Withes	0	6	„

Powderwood, alder, and willow, sold at 50*s.* per load, delivered to railway station, in 1877.

Prices paid for making Hoops in 1877.

	s.	*d.*	
Fourteen feet	1	3	per bundle.
Middling	1	1	„
Long pipe	1	0	„
Short „	0	8	„
Hogshead	0	10	„
Barrel	0	10	„
Kilderkin	0	10	„
Firkin	0	10	„
Long pink	0	10	„
Short „	0	8	„
Tumbril	0	7	„
3-gallon bottle	0	9	„
2- „	0	8	„
1- „	0	7	„

Tying hoop chips, at per hundred bundles, 2*s.* 3*d.*

Names of Bundles, Lengths of Hoops cut, and Number in each Bundle.

Fourteen feet	14 feet long	60
Middling	13 „	60
Long pipe	12 „	60
Short „	11 „	60
Hogshead	9½ „	90
Barrel	8½ „	120
Kilderkin	7½ „	120
Firkin	6½ „	180
Long pink	5½ „	240
Short „	4½ „	240
Tumbril	4 „	240
3-gallon bottle	3½ „	360
2- „	3 „	360
1- „	2½ „	360

Sold at per load of 30 bundles, delivered free at buyer's premises in London.

Hoops sold at per Load of 30 *Bundles, delivered in London, in* 1877.

	£	s.	d.	
Fourteen feet	6	7	6	per load.
Middling	5	7	6	„
Long pipe	4	7	6	„
Short „	3	0	0	„
Hogshead	3	7	6	„
Barrel	4	5	0	„
Kilderkin	4	0	0	„
Firkin	4	5	0	„
Long pink	4	10	0	„
Short „	3	12	6	„
Tumbril	2	12	6	„
3-gallon bottle	3	10	0	„
2- „	2	10	0	„
1- „	2	5	0	„

Less the carriage to the station, and railway charges to London, about 13*s*. per load.

To landowners who prefer to sell underwood standing, the following Conditions of Sale, &c., may be useful:—

I. Except that the Auctioneers reserve the right of refusing a bidding, the highest bidder shall be the Purchaser; and in case any dispute shall arise between two or more bidders, the Lot in dispute shall be put up again and re-sold. The bidding for each Lot to be at per acre.

II. That no person shall advance less than two shillings and sixpence under five pounds, five shillings under ten pounds, and ten shillings above ten pounds, at each bidding.

III. That the Underwood of the Lots, stated to be computed, is to be taken by the Purchasers at the quantity stated in the printed bills of this Sale.

IV. The Purchaser of each Lot shall immediately after the Sale pay a deposit of twenty pounds per cent. into the hands of the Auctioneers as part of the purchase-money, and shall give security to the satisfaction of the Vendor's Agent for the payment of the remainder at . . . . .on or before the sixth day of May, 18 , before which day all the Lots (except those mentioned in the 3rd Condition) shall be measured by a competent Surveyor, appointed and paid by the Vendor, or sixpence in the pound will be allowed on immediate payment of such remainder, subject to final settlement on the Lots to be measured; and in case of non-payment of such remainder of the purchase-money, or any part thereof, on or before the said sixth day of May, the Vendor may, at any time after such default (without prejudice to any other remedy for recovering the said purchase-money), seize, retake, retain, and sell to any other person or persons the said Underwood or any part thereof, and the produce thereof, and of any part thereof, and whether converted or unconverted, and wheresoever or in whosoever's possession the same, or any part thereof, respectively, may then be, for making good the purchase-money, or such part thereof as shall remain unpaid. And also interest at the rate of ten pounds per cent. per annum, on all balances from time to time remaining due from and after the said sixth day of May.

V. That the Vendor reserves to himself sufficient live stuff for the fences, where required, and the Purchasers are to leave standing all tellers whatsoever. and such stems, hollies, and plashers as are marked with paint; and if any tellers, or stems, hollies, or plashers which are so marked, or any tree or trees, are cut down or destroyed by the Purchaser or Purchasers, or his or their workmen, or if he or they shall commit any other damage, injury or spoil whatsoever, such Purchaser or Purchasers shall pay treble the amount of the value thereof, and all costs of assessing the same. All damages with the expense of assessing the same, shall be paid to the Vendor's Agent within seven days after the publication of the award of the referee, as appointed in the last Condition hereunder.

NOTE.—*Special attention is called to the foregoing Condition, which will be strictly enforced.*

VI. That the Purchaser or Purchasers of each Lot shall have, or cause to have, all goods arising from the Lots, cleared off or stacked in places pointed out by the Vendor's Woodwards, or in default thereof in places where the least possible damage may accrue, on or before the first day of May next (but no stack shall be made within four feet of any boundary fence) under a penalty for each Lot of ten shillings per day, for every day after the said first day of May, on which any portion of the goods so arising shall not be stacked as aforesaid; except the stackwood and the alder and willow left for stripping, which are to be stacked in a similar manner, on or before the twenty-fourth day of July next, under a penalty of ten shillings per day as aforesaid, and all goods whatsoever, except stackwood, shall be entirely cleared off the premises before the twenty-eighth day of September next, and the stackwood on or before the twenty-eighth day of September, 188 ; or on and after either of these days respectively, all goods of either description which shall then remain thereon, shall become absolutely the property of the Vendor, any Condition, Sale, or ether transaction to the contrary notwithstanding. And if any wilful or other damage is done in removing any portion of the goods produced on or from any of the said Lots, the Purchaser or Purchasers shall pay for the same in the same manner as provided in Condition fifth. In all cases the Purchaser or Purchasers, or carriers employed by him or them, shall make use of the usual and accustomed roads only, or such other roads as are pointed out by the respective Woodwards; all other or new roads, made or used by him or any of them, will be accounted and assessed as wilful damage as before provided.

VII. That the whole of the Underwood in each of the Lots in this Sale (except the alder and willow left for stripping), and all single alder in each Lot (which the Vendor reserves the right of having cut off the stem at any earlier time he may think fit) shall be cut off the stem on or before the twenty-fifth day of March next, under a penalty of ten shillings per day as aforesaid, and subject to Conditions 5 and 8; and the alder and willow so left for stripping (where not otherwise provided) shall be cut off the stem on or before the twenty-fourth day of June next, under the like penalty and Conditions. And the Purchaser of Lots shall not be entitled to enter thereon for any purpose whatever, before the twelfth day of January next, if not previously shot over, nor of Lots before the twentieth day of November next.

VIII. If any Purchaser or Purchasers neglect or fail to complete the purchase agreeable to these Conditions, the deposit-money shall be forfeited, and the Vendor may re-sell such Lot or Lots, or goods arising from the same, either by public auction or private contract; and the deficiency, if any, on such re-sale with all charges attending the same, shall be made good to the Vendor by the defaulter at this present Sale, and if not immediately paid, to be recovered as and for liquidated damages.

And Lastly, all damages and other charges arising out of the infraction of any of the foregoing Conditions, or any matter or thing relating thereto, if not thereby provided, shall be submitted to the sole umpirage or award of Mr. , the Auctioneer at this Sale, or to some person to be appointed by him in writing, such award to be binding on all parties; and for the better enforcing the performance thereof, such submission or reference shall be made a rule of the Court of Queen's Bench, pursuant to the statute in that case made and provided.

Contract for Purchaser.

I do hereby acknowledge that I have this day purchased, by public Auction, Lot of the Underwood mentioned in the foregoing Particulars, for the sum of and have paid into the hands of the Auctioneer the sum of as a deposit, and in part payment of the said purchase-money; and I do hereby agree to pay the remaining sum of unto the Vendor's Agent, at , on or before the 6th day of May, 18 , and in all other respects, on my part, to fulfil the foregoing Conditions of Sale.

As witness my hand this 5th day of November, 18 .

Purchase-money for Lot .. £
Deposit now paid .. .. £
Remaining unpaid .. ..
Witness

Contract for Vendor.

I do hereby acknowledge that has been this day declared Purchaser of Lot of the Underwood mentioned in the foregoing Particulars, at the sum of and that he has paid into my hands as a deposit, and in part payment of the said purchase-money; and I do hereby agree that the Vendor shall, in all respects, fulfil on his part the foregoing Conditions of Sale.

As witness my hand this 5th day of November, 18 .

Purchase-money for Lot .. £
Deposit now paid .. .. £
Remaining unpaid .. ..
Witness

No underwood varies more in value than alder and willow, locally known as powderwood. When wars prevail alder is in demand. In the piping times of peace it is a drug and is sold for firewood. It has the merit of growing and thriving in bogs and swamps, in which little else can live. The period at which powderwood can be stripped is from the 24th of May to 24th of June.

Within a circle of ten miles round Midhurst 1500 acres of underwood are annually sold by auction, chiefly on the foregoing terms. One working coppice-buyer is frequently surety for another. To the honour of the craft, instances of men failing to meet their payments are rare. Landowners will find it greatly to their advantage to keep the clearing roads in good order, also fences, water rails, and gates. Cattle, as well as hares and rabbits, are very partial to the "first shoot."

A recent introduction of hoops from abroad, at a low price, threatened to injure the English trade. The foreign hoops have not proved durable and the home-made are again in request.

Although coal has not been discovered in Sussex, some remains of ancient foundries exist. I have recently drained a quagmire, a clearing road for woods, and made a firm road by a thick layer of cinders laid on wood fagots. The bed of cinders on which I draw is 20 feet deep and several yards wide, in a wood of Major Hollist's, known as Furnace Coppice, close to Furnace Pond, parish of Lynchmere, where in former days ironfoundries existed. Good specimens of Sussex iron firebacks, bearing the Montague Arms, are preserved in the mansion at Cowdray Park. Other designs may be found in the open hearths of many farmhouses in the county.

V.—*Abstract Report on Rot in Sheep.* By J. B. SIMONDS, Principal of the Royal Veterinary College, and Consulting Veterinary Surgeon to the Society.

WITH reference to the existing disease among sheep, commonly known as Rot, it is important that agriculturists should understand that the malady is one exclusively depending on the existence of parasites in the liver, ordinarily called Flukes. The embryos of these creatures enter into the stomach of the sheep in a form so minute as to escape ordinary observation: they may indeed be described as infusoria, abounding in water, and in wet pasture-grounds. From the stomach the embryos pass into the intestine and thence onwards to the gall-ducts of the liver, where they quickly increase in size and become as flukes sexually mature. The ova—eggs of the fluke—are deposited in the gall-ducts in immense numbers, and, flowing out with the bile into the intestinal canal, they are freely distributed with the fæculent evacuations of the sheep wherever the animal may roam. It has been calculated that a single fluke will mature 40,000 ova. In due course the expelled ova give birth to the infusorial embryos, which in an advanced stage of development again enter the bodies of sheep and other animals. It is thus that rot persists from year to year, and especially on wet farms. A few flukes may not be attended with any serious ill-consequences; but the existence of a large number in the liver early produces structural changes in the organ itself, which, with the consumption of the bile on which the parasites live, ultimately cause a dropsical condition of the entire body of the affected animal, and necessarily lead to its death.

It is only in an advanced stage of the disease that rot can with certainty be recognised, and frequently too late for curative remedies to be of much avail. Thus, for instance, the present serious outbreak of the disease had its commencement during the summer of last year. It was at that time, and more especially in the months of July, August, and September, that in consequence of the excessive fall of rain saturating the ground with wet, and producing the overflow of streams and rivulets, that the fluke-embryos in vast numbers were taken in with the food of the sheep. Had agriculturists then adopted means, which were pointed out as far back as 1862, to prevent the embryos, thus widely dispersed, developing into young flukes within the organism of the sheep, hundreds of animals now falling a sacrifice to rot would have been saved.

These and other important and kindred facts connected with the parasitic origin of the disease and its prevention were set forth in an Essay on Rot, which was published originally in the Society's 'Journal,' in 1862, and is now republished in a separate form, with extensive additions, for circulation among agriculturists in general.*

It is well known that in many valley farms and wet feeding-grounds sheep will take the rot in any year, be the state of the weather what it may; but the whole history of the disease from the earliest times, as well as all recent investigations into the natural history of the liver-fluke, show that in wet summers danger is incurred by the pasturing of sheep on land which under ordinary circumstances would be safe. Outbreaks equally as extensive and fatal as the present have occurred in this country in past years; and, dating back to 1735, the following periods may be quoted as examples: 1747, '66, '92, 1809, '16, '24, '30, '53, and '60. Ireland also suffered to a most serious extent in 1862, when wet weather prevailed there throughout the year; but in England, on the contrary, the summer being dry, only partial occurrences of the disease were observed, especially on wet and boggy pasture land.

The rot of 1830–1 is believed to have been the most serious outbreak of any recorded, evidence of the destruction of not less than two millions of sheep having been given before a Parliamentary Committee, which sat in 1833 to inquire into the causes of the depressed state of agriculture. The rot of 1860 also swept away thousands of sheep, and affected large numbers of cattle, the year having been, like the past one, remarkable for the almost uninterrupted rainfall for weeks together. So long as the weather continues warm and humid into the autumn, so long does great danger exist; but a change from wet to dry, and especially the occurrence of sharp frosts, speedily arrests the development of the fluke-embryos.

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* 'The Rot in Sheep: its Nature, Cause, Treatment, and Prevention.' Illustrated with Engravings of the Structure and Development of the Liver-fluke. By James Beart Simonds. London: John Murray, 1880. Price 6*d.*

From these premises it may be inferred that should the forthcoming summer prove hot and dry, little fear need be entertained of a recurrence of the disease; and not only so, but that many infected sheep, in which only a few flukes exist, will, by the care and attention which had been bestowed upon them during the winter, be greatly invigorated and saved to the farmer.

The circumstance before alluded to, of certain pastures being always dangerous under any conditions of weather, should never be lost sight of; for if sheep are fed thereon for a very limited time only they will contract the rot. Many well-authenticated cases of the quick contamination of sheep are recorded, the details of which are given in the pamphlet already referred to. A perusal of these cases will show that an hour or two will often suffice for the conveyance of fluke-embryos into the system in sufficient numbers as ultimately to cause the death of the animal from rot.

Many causes are in operation to influence the rapidity with which the organism of the sheep yields to the disease. Some of these belong to the conditional state of the animal itself, and others to the circumstances by which it is surrounded. Apart from such diseases as may co-exist with rot, the chief of the constitutional causes are the number of flukes inhabiting the biliary ducts, the natural stamina of the animal, and its amount of flesh at the time of the declaration of the symptoms. Age also, and the purposes for which the sheep are kept, exercise an important influence upon the progress of the affection. Thus breeding or nursing ewes, from the demand made on their systems for the development or support of their young, will generally succumb more readily than store sheep, and most assuredly much sooner, all other things being equal, than those which are being fattened for the market. Lambs also, when affected in the first few months of their age, will, for want of sufficiently matured strength of constitution, soon sink under the malady.

Among the beneficial and surrounding circumstances few are so potent as a continuous supply of food rich in the elements of blood, and containing comparatively a small proportion of water. Sheep thus fed will long resist the debilitating effects of the flukes, as well as the changes which are taking place in the liver.

It is easy to understand that the existence of the parasites being associated with an almost continuous supply of watery or innutritious food, and exposure of the animal to a low temperature and variable weather, will the sooner produce a bloodless state of the system than when the opposite state of things obtains. Hence the quick progress of rot in the autumn and winter, more especially if wet weather should long prevail.

With regard to the time of the manifestation of the symptoms of the disease after flukes have entered the gall-ducts, it is almost impossible to speak with any degree of certainty. A combination of unfavourable circumstances may give rise to them in five or six weeks; while, on the contrary, the majority of things being favourable, even months may pass before evidences of rot are unmistakably declared. No hasty generalizations should ever be come to on such a point as this.

The latent stage of rot—viz. the period which elapses between the entrance of the embryos of the fluke and their change into perfect flukes and attainment of sufficient size to begin to drain the organism—is of the first importance to the practical agriculturist. During its continuance he may avail himself of many means which will to a great extent secure him against loss; but unfortunately he too often fails in the right application of these means, because he is not assured by any well-marked symptoms of the existence of the malady.

Great changes in the health of the animal may have insidiously crept on; but they are none the less serious on that account. A loss of condition is early to be observed, and as time passes it becomes more and more perceptible. The placing of the hand on the back will show that the muscles on each side of the vertebræ are so wasted that the spinous processes of the bones project above them. The animal, in common language, is "razor-backed." The same leanness pervades the entire frame, and everywhere the processes of the bones are more prominent than usual. The general contour of the body is also changed. Often when the wasting commences, the belly is gaunt, but it soon begins to enlarge and grow pendulous from effusion into the abdominal cavity. In the advanced stages of the malady this gives a still further altered outline to the body, for the loins now sink or droop, and the animal becomes "hollow-backed."

The general surface of the skin loses its ruddy hue, and becomes deficient of the unctuous secretion which in health belongs to it. This renders the wool harsh and dry, and leads also to its easy separation from the follicles. A dry scaly state of skin, on the inner parts of the thighs, particularly where it is only partially covered with either wool or hair, is likewise present early in the affection.

As the disease advances the animal becomes dull and dispirited, and has a peculiar dejected appearance, with an expression of countenance common to many parasitic diseases.

An examination of the eye will materially assist in determining not only the existence but the extent of disease. If the lids are everted and the "haw" pressed forward, it will be found in the *early stages of the malady*, and especially if the animal has been excited by being driven a short distance, that *the vessels are turgid with pale or yellowish-coloured blood, and that the whole part has a peculiar moist or watery appearance.* Later on, these vessels are blanched, and scarcely to be recognised, excepting perhaps *one or two* which present a similar watery condition.

In addition to the symptoms thus named it will be found that the animal's appetite becomes fastidious. To-day it feeds pretty well; to-morrow it will scarcely touch food of any description. An increased thirst, however, is now present, and continues till the end. The animal is often going to the brook or pond, or, if prevented from doing this, will omit no opportunity of drinking from the little hollows which exist on the surface of the field. Associated with the increased thirst is an irregular state of the bowels. For a few days together diarrhœa will be present, when it gives way to the ordinary condition of the fæces. A persistence of this variable state of the evacuations, when not traceable to a change of food, or other common causes, depends chiefly on an altered state of the bile, by which the fluid acts as an irritant to the mucous membrane of the intestines.

As the disease advances to its fatal termination the animal's breathing becomes short and quick, and is occasionally accompanied with a slight and nearly inaudible cough. Dropsical swellings come on in different parts of the body, especially around the throat and beneath the lower jaw. The accumulation of the effused fluid in this situation is to be referred in part to the pendant position of the head in feeding. There is no surer proof of approaching death than these swellings, for they indicate a dropsical condition of the entire system, and mainly of the subcutaneous tissue. The prostration of the vital powers day by day increases. The pulse becomes weak, wavering, and indistinct. The animal lies a good deal, refuses all food, is in a state of semi-stupor, and dies from pure exhaustion, as the consequence of general anæmia.

Many remedies have been forced on the notice of agriculturists from time to time, both in this country and also on the Continent, for the cure of rotten sheep—all of which have, however, signally failed in verifying the statements of their originators. At the commencement of the present century a remedy emanating from a Dutch source was loudly extolled, and even largely used in this country as well as in Holland, but it soon fell into disrepute. No treatment of rot can be considered as being more than palliative; still, in carrying this principle into practice, great benefit often arises, as the owners of infected animals are secured against losses which otherwise would be very heavy. The earlier the disease is detected the better; but its discovery is far too frequently not made until the autumnal period of the year, when external circumstances are much against the success of any system of treatment or management, and when also important structural changes are taking place in the liver.

The animals must be carefully guarded against all vicissitudes of weather by being folded in the best sheltered situations, more especially at night. Their food should consist of a liberal supply of materials which are rich in flesh-forming principles, and which also contain a large proportion of sugar, starch, and similar ingredients, that the heat of the body may be kept up equally with nutrition. If placed on meadows or artificial grasses, the sheep should be often changed, care being taken to avoid those pastures which are wet and cold, or which contain inferior herbage. Manger-food must be supplied, and this should consist, in part at least, of *crushed* corn, of which beans, peas, lentils, &c., are to be preferred. Oats and maize are also good, and to these a moderate allowance of oil-cake may be added. Frequent changing of the food will induce the animals to eat more, for which reason, when they are on the pastures, no objection is to be taken to an occasional supply of turnips or other roots; but, unless compelled by the character of the farm and the system of cultivation, continuous folding on turnips should be avoided. Where this has to be done, great care will have to be exercised in regulating the quantity of turnips, according to the condition of the crop, the state of the weather, &c. Under such circumstances an allowance of good hay, in addition to the other food, will be imperatively required.

Medicinal agents will likewise have to be had recourse to, preference being given to those which impart tone and vigour to the system.

Salt cannot be dispensed with. It does good in several ways. It is an agent which acts as a stimulant to the process of digestion, and, by its ready solution and free entrance into the blood, it supplies also the amount of soda which may be required for the secretion of bile.

The other medicinal agent to which reference has been made as imparting vigour to the system is the sulphate of iron. As a tonic it is excelled by few, if by any, therapeutic agent; while the readiness with which it can be obtained, and the lowness of its price, give it an advantage over many others. Sheep also do not object to take it with their food when mixed in proper proportions; nor is it a matter of much moment if one animal should get rather more than his fellow, by more rapid or longer feeding at the trough. Sulphate of iron is likewise an excellent agent for the expulsion of several of the varieties of *intestinal* worms. Its chief use, however, in rot is its powerful effect in the reproduction of the red cells of the blood. In all diseases, therefore, in which there is a diminished power of producing red cells, the sulphate of iron is a valuable remedy.

Stomachics or carminatives are likewise required; of which medicaments preference is given to aniseed in this affection.

A good compound of these several medicinal agents with some highly nitrogenised alimentary matters is contained in the following formula. Take of—

Finely-ground oil-cake (linseed) ..	each 1 bushel.
„ pea-meal	
„ salt	each 4 lbs.
„ aniseed	
„ sulphate of iron	1 lb.

Let the salt, aniseed, and sulphate of iron be mixed together first, and afterwards well incorporated with the cake and pea-meal.

The quantity of the mixture to be given to each sheep daily should be *half a pint to a pint*, in addition to an ordinary allowance of corn or cake and hay-chaff. It may be used with advantage for three or four weeks in succession, but should be discontinued occasionally for a day or two, especially if the animals become affected with diarrhœa.

By means of this kind many sheep may be either brought into, or kept in, such condition, as will enable the proprietor to dispose of them at a price which will considerably diminish the loss he would otherwise sustain.

Rot when fully established can only be viewed, however, as being incurable; but, nevertheless, the knowledge of its cause and nature holds out no faint hope of our being able to prevent it.

In adopting preventive measures we must not lose sight of the well-known circumstance that sheep never take rot on salt marshes, although the ground is generally saturated with moisture. It may, however, be rightly asked, upon what does this immunity depend? The answer to the question is both easy and satisfactory. Salt-water is destructive to the fluke-embryos as they escape from the eggs. These infusorial creatures belong to fresh water, and to this alone. It is here that they pass through their several gradations when out of the body to fit them for their ultimate development into flukes by entering the digestive organs of sheep. If flukes, however, should have taken up their abode in the liver prior to the sheep being placed on salt marshes, they are beyond the reach of harm. The character of the daily food will have but little effect on the parasites, and the disease will gradually progress to a fatal termination.

Thus it will be seen that the removal to salt marshes as a *preventive* measure is valuable, but as a curative one it is only fallacious. It is, however, a preventive within the reach of but very few persons, and even these may not have recourse to it sufficiently early; they may keep their sheep at home during a wet summer, until all the mischief has been done.

It may be asked, what means can the agriculturist employ at home for the purpose of destroying the immature forms of the fluke after they have entered the stomach of the sheep? This brings us again to the administration of salt as an effectual agent for the purpose. Its combination with sulphate of iron and aniseed will materially increase its preventive power. Indeed no better medicinal compound for this purpose can be employed than the one named when speaking of the treatment of the disease. The daily use of the mixture will not only arrest the further development of the fluke-embryos, but will destroy the early-hatched flukes, and thus remove the cause of the malady. The rules for the use of the medicated food must, however, be modified, as the object sought is somewhat different.

It is almost impossible to reckon upon the time the compound may have to be employed, and therefore care should be taken that no ill effects follow its long-continued use. In a wet year, like that of 1879, it may be found requisite to commence its use early in June, if not in May, and to continue it to the end of October. Under such circumstances, however, if a moderate quantity only is allowed daily, no possible harm can arise. To meet a difficulty of this kind, however, the proportion of the medicine to that of the nitrogenised food should be altered by adding to the two bushels of linseed-cake and pea-meal *two more bushels* of corn. We prefer *one of crushed oats and another of crushed maize*, to both being of the same kind. Either is good food for sheep, but a mixture of them is better. The relative proportion of the salt and of the other ingredients is thus reduced one-half, thereby enabling the agriculturist to vary the amount of the medicine according to circumstances, but always securing the partaking of some of it by using *from half a pint to a pint daily of the food-compound, divided or not into two feeds.* Provision also is thus made for the nutrition of the animals when the grasses have lost much of their quality, as they invariably have when surcharged with moisture.

A difficulty frequently exists in getting sheep to eat "manger-food," especially if mixed with hay-chaff, when the animals are at grass during the summer, but this is not insurmountable. Most farms yield at this period of the year some green food, such as tares, clover, Italian rye-grass, &c., a small quantity of which can be daily cut into chaff, with a proportion of hay, for mixing with the other food. Judicious management will surmount many a little difficulty, and the result will be an ample reward for the care and attention which had been bestowed on the animals. If the system be properly carried out, little fear of the occurrence of rot, even in the most unpropitious seasons or on land proverbially bad for sheep, need be entertained.

It will be seen that the quantity of salt and sulphate of iron which I have named is much below that which is ordinarily used. No doubt a larger amount may be safely employed, but it is to be remembered that the *preventive power of the compound depends more on its long-continued use* than on the largeness of its quantity for a time. A change of weather may call for its complete withdrawal, but, on the contrary, it may have to be continued throughout the entire summer and even long into autumn. The fondness of animals for salt will lead them to partake readily of an amount which may, under certain circumstances, be productive of considerable mischief. Agriculturists need therefore to be put on their guard respecting an abuse of this valuable agent.

Little more need be said respecting the employment of salt in the prevention of rot, except to take objection to the suggestions which have been made to sow it on the land, with a view of destroying the fluke-embryos. If two or three applications of it in a year would do this, even should the herbage suffer for a time, I, perhaps, should not be found to dissent from the practice. But when it is remembered that the natural history of the liver-fluke establishes the fact that brood after brood of embryos are being produced from ova, cast *daily* out of the bodies of rotten sheep, and that the hatching process therefore goes regularly on day by day, and week by week, for several consecutive months, the necessity for frequent repetitions of salt in the same year becomes apparent, and these could not fail to be highly injurious to the pasturage, more especially on the retentive clays, where rot prevails. Repeated small dressings of lime I can conceive to be nearly as efficacious as those of salt in destroying the fluke-embryos, and these would stimulate the growth of better grasses, besides proving of permanent benefit to the soil; nevertheless, neither salt nor lime-dressing of land must be depended upon as a preventive of rot.

VI.—*Report on the Field and Feeding Experiments conducted at Woburn, on behalf of the Royal Agricultural Society of England, during the Year* 1879. By Dr. AUGUSTUS VOELCKER, F.R.S., Consulting Chemist to the Society.

THE EXPERIMENTS ON THE CONTINUOUS GROWTH OF WHEAT.

BEFORE the experiments on the continuous growth of corn were instituted, a crop of wheat, yielding 25½ bushels of dressed corn and 20½ cwts. of straw, was grown by the late tenant in 1875. Since that time wheat has been grown every year, and thus the same land yielded in 1879 the fourth crop of wheat in succession, or the third crop since the systematic experiments were begun.

The mineral manures in the quantities given in the tabulated results on the following pages were sown on plot 8 and plot 9 on the 8th of November, 1878, and on plots 4, 5, and 6, on the 9th of November.

The seed—Browick wheat—was drilled in on the 2nd of November, when the land was in excellent condition for the reception of the seed; nevertheless, the plant only made its appearance above ground on the 30th of December, the wheat having been about two months in the ground before it got through the surface.

The salts of ammonia and nitrate of soda were sown on the 7th and 8th of March, 1879.

The dung on plots 10 and 11 was applied on the 24th of January, 1879.

In 1877 and 1878 the dung was applied to the land in a long and undecomposed condition, which had the effect of making the naturally very light soil of the experimental field still more loose. Moreover, it appeared to me that too much litter was used in the making of the dung. In order to remedy these defects the dung used in the wheat and barley experiments for 1879 was made in the Woburn feeding-boxes in the autumn of 1878, less litter than in the two preceding years being used, and it was cut into chaff instead of being used long as formerly.

The requisite quantity of dung required for the experiments on the continuous growth of wheat and barley was produced by eight bullocks, four making dung for the wheat and four for the barley experiments.

The bullocks were put into the feeding-boxes on the 8th of October, when their weight was as follows:—

Bullocks making Manure for Permanent Wheat Experiments.

	Cwts.	qrs.	lbs.	
No. 1	9	1	3	Total weight of four bullocks on the 3rd Oct., 1878, 1 ton 18 cwts. 15 lbs.
„ 2	9	1	24	
„ 3	10	0	8	
„ 4	9	1	8	

Each bullock received daily as food: 4 lbs. decorticated cotton-cake, about 6½ lbs. Indian corn meal, 48 lbs. of white turnips and 8 lbs. of wheat-straw chaff; and by the 5th of November, that is in five weeks, they had consumed:—

Decorticated cotton-cake	5 cwts.
Indian corn-meal	8 cwts.
White turnips	3 tons.
Wheat-straw chaff	10 cwts.

and, trodden into dung, 11½ cwts. of wheat-straw, cut into chaff of about 2-inch length.

When the dung was removed from the boxes it was short (straw chaff having been used as litter), fairly well-fermented, and in a condition fit for being placed on the land at once. In order to prevent loss of more or less of the soluble and most valuable fertilising constituents during November, December, and January, it appeared to me advisable to delay the application of the dung to the land until the end of January. In the meantime the dung removed from the feeding-boxes on the 5th of November was put into a covered hovel, closed in on all sides.

On the 24th of January, when the dung was applied to the wheat, it was weighed, and the requisite quantity, containing the calculated amount of ammonia required, namely, nitrogen equal to 100 lbs. of ammonia on plot 10, and 200 lbs. on plot 11, was applied to these experimental plots.

The four bullocks fed as stated above, and kept in feeding-boxes littered with 11½ cwts. of wheat-straw, cut into chaff about 2 inches long, in round numbers, made 2½ tons of rotten dung, weighed after having been kept for nearly three months under cover.

The dung was applied to the land as a top-dressing; and when I inspected the experimental field on the 7th of March, 1879, it had become well amalgamated with the land; the soil was firm and the wheat looked well and promising.

On the 5th of November the bullocks which made the dung for the wheat experiments weighed as follows:—

					Gain from Oct. 3 to Nov. 5, 1879 (5 weeks).		
	Cwts.	qrs.	lbs.		qrs.	lbs.	
No. 1	9	2	5	—	1	2	Total gain in 5 weeks, 1 cwt. 1 qr. 4 lbs.
„ 2	9	2	17	—	0	21	
„ 3	10	1	27	—	1	19	
„ 4	9	2	26	—	1	22	

The four bullocks accordingly increased 28⅘ lbs. per week, or each gained on an average 7⅕ lbs. per week.

On some of the experimental plots the wheat suffered from the attacks of wire-worm, and bare places had to be filled up by transplanted wheat. By dint of much trouble a fairly uniform plant was produced on the several plots, and no expense was spared to keep the land free from weeds, which proved a most difficult task in a wet and bad season like that of 1879.

The wheat was cut on the 8th of September, and carted and thatched on the 17th of September, 1879.

Directly after the field had been cleared of the wheat, it was scuffled and drag-harrowed with a view of killing weeds, and ploughed rather shallow on the 15th and 16th of October.

Threshing in the field by means of a portable engine commenced on the 30th of October, 1879. The straw of each plot was weighed in the field, and the corn of each plot bagged, carefully labelled, and stored in the granary until the 19th of November, when the gross weight of corn from each plot was ascertained; and this weight was checked by measuring the produce of each plot, and weighing separately every bushel of corn produced on the eleven experimental ¼-acre plots. In this way the possibility of a serious mistake in taking down the weight of corn may be avoided, and at the same time the average weight of a bushel of corn may be ascertained more correctly than by weighing only 1 or 2 bushels. I may mention that the differences in the weight of several bushels of corn from the same plot seldom varied more than from ¼ to ½ lb. The weight per bushel in the following tabulated results is the average weight of the several separate weights of every bushel of corn grown on each plot. There is no need of embodying in this report all the figures which were obtained in weighing the produce of the experimental wheat-field; but in order to show clearly how close is the agreement of the gross weight of corn and the sum of the separate weighings of each bushel usually turned out in the wheat and barley experiments in 1879, I quote the details obtained on plot 5.

Weighed with the bags, the corn weighed 379 lbs., bags alone 9 lbs., leaving the total net weight of corn 370 lbs. Bushelled out, the wheat on plot 5 gave:

1st	bushel,	weighing	54½	lbs.
2nd	„	„	54½	„
3rd	„	„	54	„
4th	„	„	54	„
5th	„	„	54	„
6th	„	„	54	„
		and	43½	„

Total weight, 368½ lbs.

The difference in the weight, as ascertained by weighing the whole of the produce in one operation on an ordinary weigh-bridge and measuring out and weighing each bushel separately, it will be seen, does not exceed 1¼ lb. I select this plot for illustration because it showed the greatest difference in these weights on any one plot. In some cases the total weights, as ascertained on a rough weighing machine in one operation, and by adding the weights of the several bushels as determined on a more delicate weighing-machine, differed not more than ¼ or ½ lb.

The table on page 134 shows at a glance the treatment of each plot as regards manure, and the result of the harvest of 1879.

1879 was such a cold and wet season that the wheat in many places, especially on heavy land, did not fill well, and turned out a more or less complete failure. Thus in Mr. Lawes' experiments, the continuously unmanured plot produced scarcely more than 4 bushels of wheat per acre; and on all the manured plots the produce sank down to an abnormally low figure in comparison with the average produce in fairly good corn-growing seasons.

I have therefore some hesitation in making any comments on the results of the wheat harvest on the experimental field at Woburn in 1879, and shall not attempt to reconcile any anomalies which may be due to inequalities in the soil of the field, partial destruction of the plant by wire-worm, blight, and other circumstances over which the experimenter has no control. Nevertheless, the experiments on the continuous growth of wheat in 1879 present some interesting features upon which I may be allowed to dwell for a few moments.

Comparing the produce of the unmanured plot 1 with that of the preceding year, it will be seen that in 1878 the weight of dressed corn per acre was 943 lbs., as against 490 lbs. in 1879; and that, whereas the bushel on plot 1 weighed 60 lbs. in 1878, it weighed only 48½ lbs. in 1879. In the produce of straw on plot 1 in 1879 there is a falling off of 6 cwts. 2 qrs. and 18 lbs., as compared with the produce in straw in 1878. The second unmanured plot, No. 7, has again produced less corn than plot No. 1. This is now the third year in which this has been observed.

Thus, in the years 1877–1879, the two unmanured plots, 1 and 7, yielded respectively;—

	Plot 1 (Unmanured).		Plot 7 (Unmanured).	
	Dressed Corn.	Weight per Bushel.	Dressed Corn.	Weight per Bushel.
	Bushels.	lbs.	Bushels.	lbs.
1877	22⅛	61·8	20⅞	61·1
1878	15·8	60	12	58·6
1879	10·1	48½	7½	50·0

PRODUCE OF WHEAT. THIRD SEASON, 1879.

Plots.	Manures per Acre.	Produce per Acre.			
		Dressed Corn.			Straw, Chaff, &c.
		Weight.	Number of Bushels.	Weight per Bushel.	
		lbs.		lbs.	cwts. qrs. lbs.
1	Unmanured	490	10·1	48½	12 3 14
2	200 lbs. ammonia-salts, alone (applied in the spring)	756	14·7	51¼	20 2 22
3	275 lbs. nitrate of soda (applied in the spring)	604	12	50¼	19 1 21
4	200 lbs. sulphate of potash, 100 lbs. sulphate of soda, 100 lbs. sulphate of magnesia, 3½ cwt. superphosphate of lime	538	11·5	47	17 0 22
5	200 lbs. sulph. potash, 100 lbs. sulph. soda, 100 lbs. sulph. magnesia, 3½ cwts. superphosphate of lime, and 200 lbs. ammonia-salts (in spring)	1480	27·3	54¼	35 0 26
6	200 lbs. sulph. potash, 100 lbs. sulph. soda, 100 lbs. sulph. magnesia, 3½ cwts. superphosphate of lime, and 275 lbs. nitrate of soda (in spring)	1412	25·5	55	36 2 22
7	Unmanured	376	7·5	50	13 1 1
8	200 lbs. sulph. potash, 100 lbs. sulph. soda, 100 lbs. sulph. magnesia, 3½ cwts. superphosphate of lime, and 400 lbs. ammonia-salts (in spring)	1603	31·2	51¼	45 2 18
9	200 lbs. sulph, potash, 100 lbs. sulph. soda, 100 lbs. sulph. magnesia, 3½ cwts. superphosphate of lime, and 550 lbs. nitrate of soda (in spring)	1418	26·7	52¾	46 2 14
10	Farmyard-manure, estimated to contain nitrogen = 100 lbs. ammonia, made from 700 lbs. decorticated cotton-cake, 1120 lbs. maize-meal, 8400 lbs. white turnips, 1400 lbs. wheat-straw, as food; and 1610 lbs. wheat-straw as litter. Weight about 3 tons	736	13·4	55	19 0 0
11	Farmyard-manure, estimated to contain nitrogen = 200 lbs. ammonia, made from 1400 lbs. decorticated cotton-cake, 2240 lbs. maize-meal, 16,800 lbs. white turnips, 2800 lbs. wheat-straw chaff, as food; and 3220 lbs. wheat-straw as litter. Weight about 6 tons	1034	18·7	55¼	24 0 20

It is quite evident that the natural productive powers of plot 1 are better than those of the second unmanured plot. Plot 7, it may be stated, is situated nearest the road-side of the field, and plot 1 is at the lower end of the field, and evidently better land than plot 7. Ammonia-salts alone, it will be seen, produced a better effect than an equivalent quantity of nitrate of soda applied without any minerals, in conformity with the results of the two preceding seasons.

The minerals without ammonia or nitrate of soda on plot 4 had a better effect on the produce than in previous seasons; but, on the whole, raised but slightly the produce in corn. Notwithstanding the unpropitious season, the addition of 200 lbs. of ammonia-salts to the minerals largely increased both the yield of corn and straw on plot 5. Thus, 200 lbs. of ammonia-salts per acre on plot 2, produced only 756 lbs. of dressed corn, and 20 cwts. 2 qrs. 22 lbs. of straw; whilst the same amount of ammonia-salts, with the addition of minerals, on plot 5 yielded 1480 lbs., or nearly twice as much dressed corn, and 1 ton 15 cwts. and 26 lbs. of straw. If the weather towards harvest-time had been warm, no doubt the produce in corn on plot 5 would have been much more considerable, for the weight of straw and general luxuriant appearance of the wheat-crop on plot 5, clearly showed that all that was wanted to insure a heavy yield was heat and sun to ripen the crop. As it was, the wheat on plot 5 weighed 54¼ lbs. per bushel, and was a better sample than that on plot 2, manured with ammonia-salts alone, which weighed only 51¼ lbs. per bushel.

Nitrate of soda on plot 6, in conjunction with minerals, produced somewhat less corn and more straw than ammonia-salts and minerals.

The larger dose of 400 lbs. of ammonia-salts on plot 8, in addition to minerals, produced the heaviest crop of dressed corn and a large bulk of straw.

A still larger weight of straw was obtained by the use of 550 lbs. of nitrate of soda, in conjunction with minerals, on plot 9, but it appears at the expense of corn, which gave 4½ bushels less per acre in comparison with that reaped off plot 8. The great weight of 2 tons 6 cwts. 2 qrs. and 14 lbs. of straw per acre raised on plot 9 appears to indicate that on light soils heavy top-dressings with nitrate of soda, even in conjunction with minerals, have the effect in bad seasons of producing too much straw. The wheat on plot 9, however, it may be stated, was not blighted, but only thin.

Both the application of the more moderate quantity and of double the amount of dung, estimated to contain nitrogen equal to 100 lbs. and 200 lbs. of ammonia respectively, notwithstanding the adverse season of 1879, produced better crops than in the preceding year. Considering that only 6 tons of dung were put on plot 11, and the extremely bad wheat-growing season, 18·7 bushels of dressed wheat, weighing 55¼ lbs. per bushel and 24 cwts. 20 lbs. of straw per acre, may be regarded as a satisfactory result, which clearly proves that it is desirable to apply dung on light land short and well rotten, and not in a long, fresh condition. The cost per acre of the artificials employed in the experiments on the continuous growth of wheat and barley was the same as in the preceding year, namely:—

		About	
		£	s.
On Plot 2.	Ammonia-salts alone..	2	2
„ 3.	Nitrate of soda alone..	2	0
„ 4.	Minerals alone	3	5
„ 5.	Minerals and ammonia	5	7
„ 6.	Minerals and nitrate of soda	5	5
„ 8.	Minerals and ammonia	7	9
„ 9.	Minerals and nitrate of soda	7	5

THE EXPERIMENTS ON THE CONTINUOUS GROWTH OF BARLEY.

The manures applied for the barley were the same as those for the wheat experiments.

The mineral manures, as well as the ammonia-salts and nitrate of soda, were sown by the broadcast manure-distributor on the 8th of March, 1879, and the barley was drilled in on the 18th of March.

The dung used in the barley experiments was produced by four bullocks fed and kept in precisely the same manner as the four bullocks which made the manure for the wheat experiments. The dung, estimated to contain nitrogen corresponding to 100 lbs. of ammonia per acre for one plot, and 200 lbs. of ammonia per acre for the second plot, was put on the land on the 25th and the 27th of January, 1879:—

Total Food consumed by Four Bullocks in Five Weeks.

Decorticated cotton-cake	5 cwts.
Maize-meal	8 cwts.
White turnips	3 tons.
Wheat-straw chaff	10 cwts.

Wheat-straw, cut into chaff about 2 inches long, 11½ cwts. used as litter.

Accordingly, the four bullocks gained 56⅗ lbs. per week, or, each bullock on an average, 14 lbs. per week, or 2 lbs. per day.

The barley was cut on the 30th of August, 1879, and carted and thatched on the 20th of September.

WEIGHT of FOUR BULLOCKS which made the DUNG for the BARLEY EXPERIMENTS.

Bullock.	Weight when put upon, October 3, 1878.			Weight on the 5th November.			Increase in Five Weeks.		Total Increase.		
	Cwt.	qrs.	lbs.	Cwt.	qrs.	lbs.	qrs.	lbs.	Cwt.	qrs.	lbs.
No. 1	10	0	0	10	1	10	1	10	2	2	3
„ 2	9	1	12	10	0	12	3	0			
„ 3	9	1	6	10	0	15	3	9			
„ 4	10	0	14	10	2	26	2	12			

The plot manured with minerals only ripened a few days before the plots manured with ammonia and nitrate of soda. No apparent difference was noticeable between the nitrate of soda and ammonia plots.

The barley was threshed out in the field in the beginning of November, and the straw weighed at the time of threshing, and on the 19th of November the dressed corn was weighed, when the results were obtained as shown in the table on page 138.

It appears from these tabulated results:—

1. That minerals alone had no effect upon the produce in barley.

2. That ammonia-salts alone produced a better crop than nitrate of soda applied without minerals, thus confirming the experience of the two preceding years.

3. That 200 lbs. of ammonia-salts, in conjunction with minerals, had a slightly better effect upon barley than an equivalent amount of nitrate of soda and minerals.

4. That, on the other hand, the larger dressing of nitrate of soda on plot 9, in conjunction with minerals, produced a heavier crop than minerals and the larger dose (400 lbs.) of ammonia-salts on plot 8.

5. That the small quantity of dung applied to plot 10 did not materially raise the produce. In comparison with the yield of one of the unmanured plots (plot 1), plot 10, manured with 3 tons of dung, yielded about 1 bushel less barley; and in comparison with the barley crop on the second unmanured plot (plot 7), the dunged plot No. 10 yielded about 2 bushels more barley.

6. That double the quantity of dung used on plot 10, or 6 tons applied on plot 11, gave a large increase.

7. That one of the unmanured plots (plot 1) gave about 6 bushels more corn, and 2 cwts. 27 lbs. more straw than the second unmanured plot (plot 7).

PRODUCE OF BARLEY. THIRD SEASON, 1879.

Plots.	Manures per Acre.	Produce per Acre.					
		Dressed Corn.			Straw, Chaff, &c.		
		Weight.	Number of Bushels.	Weight per Bushel.			
		lbs.		lbs.	cwts.	qrs.	lbs.
1	Unmanured	972	19·1	50¼	13	1	5
2	200 lbs. ammonia-salts, alone	1368	27·1	50½	18	0	11
3	275 lbs. nitrate of soda, alone	1051	21·5	49	17	1	20
4	200 lbs. sulphate of potash, 100 lbs. sulph. of soda, 100 lbs. sulph. magnesia, 3½ cwts. superphosphate of lime	[626	11·8	53	10	0	11
5	200 lbs. sulph. of potash, 100 lbs. sulph. of soda, 100 lbs. sulph. of magnesia, 3½ cwts. superphosphate of lime, and 200 lbs. ammonia-salts	1495	28·7	52	21	2	5
6	200 lbs. sulph. of potash, 100 lbs. sulph. of soda, 100 lbs. sulphate of magnesia, 3½ cwts. of superphosphate of lime, and 275 lbs. nitrate of soda	1426	27·3	52¼	20	3	26
7	Unmanured	664	13	51	11	0	6
8	200 lbs. sulph. of potash, 100 lbs. sulph. of soda, 100 lbs. sulph. of magnesia, 3½ cwts. of superphosphate of lime, and 400 lbs. ammonia-salts	1489	30·8	51½	23	0	26
9	200 lbs. sulph. of potash, 100 lbs. sulph. of soda, 100 lbs. sulph. of magnesia, 3½ cwts. of superphosphate of lime, and 550 lbs. of nitrate of soda	1850	37	50	27	0	12
10	Farmyard-manure, estimated to contain nitrogen = 100 lbs. of ammonia, made from 700 lbs. decorticated cotton-cake, 1120 lbs. maize-meal, 8400 lbs. white turnips, 1400 lbs. wheat-straw chaff, as food; and 1610 lbs. wheat-straw as litter. Weight about 3 tons	949	18·2	52	13	0	6
11	Farmyard-manure, estimated to contain nitrogen = 200 lbs. ammonia, made from 1400 lbs. decorticated cotton-cake, 2240 lbs. maize-meal, 16,800 lbs. white turnips, 2800 lbs. wheat-straw chaff, as food; and 3220 lbs. wheat-straw as litter. Weight about 6 tons	1413	27·2	52	15	1	21

It will be remembered that for the last three seasons the unmanured plot 1 produced more wheat than the second unmanured plot 7; the results obtained on the unmanured barley plots during three seasons in succession exhibit similar differences, and distinctly prove that that part of the experimental field which comprises the unmanured wheat and barley plots (No. 1) is in a higher agricultural condition than that in which the second unmanured corn plots (No. 7) are situated.

It will be further seen that the produce in 1879 on all the eleven experimental plots fell considerably below that of 1878. With the exception of the dressed corn raised with nitrate of soda on plot 3, which weighed only 49 lbs. per bushel, the barley on the remaining plots weighed from 50 to 53 lbs. per bushel, or only one or two pounds less than the weight of a bushel of wheat grown on the several experimental wheat plots.

THE EXPERIMENTS IN ROTATION.

Rotation No. 1.—1877, seeds; 1878, wheat; 1879, roots; 1880, barley.

Roots, 1879.—Less litter having been used in making the dung in the feeding-boxes for the mangold experiments, and the straw used as litter having been cut into chaff, the dung came out of the boxes short and fairly well-fermented. It and the mineral manures on plots 3 and 4 were applied to the land in spring before the seed was sown.

The nitrate of soda on plots 3 and 4 was sown by hand between the rows in the middle of June, after the plants had been singled out and become well-established in the soil. Within a week's time after the application, the nitrate of soda began to tell upon the mangolds; and all the time the mangolds were in the ground the nitrated plots, especially plot 3, which received the larger top-dressing of nitrate of soda, grew more vigorously and were in a more flourishing condition than the plots which were manured with dung only.

The seed was sown in the first week of May, and came up well; but the weather was so cold in May and June that the young plants made hardly any progress, and it was only with great trouble and expense that they could be kept fairly free from weeds.

Even after the mangolds were singled and had every chance of growing, they made no start, and were miserably small in August and September. There was a regular plant on all the plots; but want of heat and sunshine told upon the crop, and when the roots had to be taken up in November they were small and weighed less per acre than I anticipated, judging from the luxuriant but deceptive appearance of the tops.

Rotation Mangolds, 1878, after Wheat.

Plots.		Produce per Acre.							
		Roots.				Leaves.			
		tons.	cwts.	qrs.	lbs.	tons.	cwts.	qrs.	lbs.
1	With dung, made from 1728 lbs. straw as litter; 5000 lbs. mangolds; 1250 lbs. wheat-straw chaff, and 1000 lbs. decorticated cotton-cake	4	10	1	8	2	2	1	14
2	With dung, made from 1728 lbs. straw as litter; 5000 lbs. mangolds; 1250 lbs. wheat-straw chaff, and 1000 lbs. of maize-meal	4	9	3	18	2	1	0	17
3	With dung, made from 1728 lbs. straw as litter; 5000 lbs. mangolds; 1250 lbs. wheat-straw chaff; and artificial manure, containing two-thirds as much nitrogen, and the other constituents, of the manure from 1000 lbs. decorticated cotton-cake; namely, 248 lbs. nitrate of soda, 100 lbs. of bone-ash (made into superphosphate), 62½ lbs. sulphate of potash and 65 lbs. sulphate of magnesia	7	19	0	26	2	19	1	8
4	With dung, made from 1728 lbs. straw as litter; 5000 lbs. mangolds; 1250 lbs. wheat-straw chaff; and artificial manure, containing as much nitrogen, and other constituents, as the manure from 1000 lbs. maize-meal; namely, 80 lbs. nitrate of soda, 16¼ lbs. bone-ash (made into superphosphate), 7 lbs. sulphate of potash, and 11 lbs. sulphate of magnesia	5	15	3	22	2	3	3	0

It will be seen that the larger dose of nitrate of soda and minerals in addition to dung, in round numbers, produced 8 tons of mangolds, topped, tailed, and cleaned; the smaller dose of nitrate of soda not quite 6 tons; and the remaining plots about 4½ tons of clean mangolds per acre.

This is a great falling off in comparison with the last year's crop, as will be seen by the subjoined tabular results, showing the produce in mangolds on the four experimental plots in the last two seasons:—

PRODUCE of ROTATION MANGOLDS in 1878 and 1879.

	Produce per Acre.							
	Roots.				Leaves.			
	Tons.	cwts.	qrs.	lbs.	Tons.	cwts.	qrs.	lbs.
Plot 1 in 1878 ..	13	2	1	0	2	15	1	0
„ in 1879 ..	4	10	1	8	2	2	1	14
Plot 2 in 1878 ..	11	16	0	0	2	15	0	21
„ in 1879 ..	4	9	3	18	2	1	0	17
Plot 3 in 1878 ..	18	13	0	20	3	13	3	0
„ in 1879 ..	7	19	0	26	2	19	1	8
Plot 4 in 1878 ..	12	15	1	12	3	3	3	5
„ in 1879 ..	5	15	3	22	2	3	3	0

Rotation No. 2.—Four acres. 1877, roots; 1878, barley; 1879, seeds; 1880, wheat.

Seeds, 1879.—The four acres of clover and rye-grass sown with the barley in the preceding year were fed-off by sheep during the summer, and the land is now sown with wheat. On one acre, 672 lbs. of decorticated cotton-cake were consumed; on the second acre, 728 lbs. of Indian corn-meal; and the third and fourth acres were separately eaten off without any purchased food. On each of the four acres ten sheep were put on the 20th of May, and kept on the seeds until July 7th, 1879 (seven weeks), when each lot was weighed and sold off. A second lot of sheep was put on the clover on the 8th of August, and kept until the 17th of September, or a period of five weeks and three days. On the 7th of October a fresh lot of sheep was put on the clover, and kept upon it until the 23rd of October, or a period of two weeks and two days, but the sheep lost in weight during this period.

The first lot of sheep kept on the clover from the 20th of May to the 7th of July, in that period of seven weeks yielded the following increase in live-weight:—

PLOTS.		Increase in Live-weight. lbs.
1.	Fed-off by 10 sheep, with 245 lbs. decorticated cotton-cake; on the land 48 days	170½
2.	Fed-off by 10 sheep, with 245 lbs. maize-meal; on the land 48 days	182
3.	Fed-off by 10 sheep, without other food; on the land 48 days	225¾
4.	Fed-off by 10 sheep, without other food; on the land 48 days	162¼

The cake-pen did not eat the cake well at first. The clover was very fine and luxuriant on all four acres, especially on plot 3, on which the barley was top-dressed in the preceding year with nitrate of soda. The second lot of sheep was put upon clover-seeds on the 8th of August, and kept on the land until the 17th of September, in which period of five weeks and three days they made the following increase in live-weight:—

Plots.		Increase in Live-weight. lbs.
1.	Fed-off by 10 sheep, with decorticated cotton-cake; kept on the land 5 weeks and 5 days ..	123¼
2.	Fed-off by 10 sheep, with maize-meal; kept on the land 5 weeks and 5 days	156¼
3.	Fed-off by 10 sheep, without other food; kept on the land 5 weeks and 5 days	113¼
4.	Fed-off by 10 sheep, without other food; kept on the land 5 weeks and 5 days	90½

The third lot of sheep was put on the clover-seeds on the 7th of October. The sheep on plots 3 and 4, which received neither cake nor corn, finished the clover on the 23rd of October; the sheep on plot 1 finished the clover and remainder of the allotted quantity of decorticated cotton-cake on the 29th of October; and the sheep on plot 2 consumed the required quantity of maize-meal on the clover-seeds on the 5th of November.

The sheep which were kept on the clover without any additional food, during a period of sixteen days lost slightly in weight; whilst the sheep eating cotton-cake and maize were kept on the clover twenty-two and twenty-nine days respectively, and gained in weight, as will be seen by the following tabulated results:—

Clover fed-off by Sheep the third time.

Plots.		Increase in Live-weight. Qrs.	Increase in Live-weight. lbs.
1.	Fed-off by 10 sheep, with decorticated cotton-cake; on the land 22 days	1	6¼
2.	Fed-off by 10 sheep, with maize-meal; kept on the land 29 days	3	12½
		Loss in Live-weight.	
3.	Fed-off by 10 sheep, without other food; on the land 16 days	0	25½
4.	Fed-off by 10 sheep, without other food; on the land 16 days	0	2¾

The following table shows the number of sheep fed on each acre, the quantity of purchased food consumed (if any), the number of days the animals were kept on the land, and the total increase of live-weight yielded:—

Plots.		Increase in Live-weight. lbs.
1.	Fed-off by 10 sheep, with 672 lbs. decorticated cotton-cake; on the land 110 days	328
2.	Fed-off by 10 sheep, with 728 lbs. maize-meal; on the land 117 days	435
3.	Fed-off by 10 sheep, without other food; on the land 104 days	313½
4.	Fed-off by 10 sheep, without other food; on the land 104 days	250

The average gain in live-weight of ten sheep kept on clover-seeds without purchased food thus was 281¾ lbs.; and, as they were kept on clover for fifteen weeks all but one day, they gained 12 lbs. per week, or 1⅕ lb. per head per week. The sheep fed upon clover and from ½ lb. to ¾ lb. of maize-meal per day, or altogether 6½ cwts. in seventeen weeks, increased 435 lbs. live-weight, or made about 25½ lbs. per week, or 2½ lbs. per head per week.

Decorticated cotton-cake did not do so well this year as last year, for it will be seen that in a period of sixteen weeks the ten sheep gained 238 lbs. live-weight, or, in other words, they increased in weight 20¼ lbs. per week, or 2 lbs. per head per week.

It must not be concluded that because in 1879 maize produced a better result than decorticated cotton-cake it is a more suitable food for sheep, for in the two preceding years decorticated cotton-cake gave a larger increase in live-weight than maize-meal.

Probably the most economical result by feeding off clover-seeds by sheep would be to give them, as additional food, from ½ lb. to ¾ lb. of mixed decorticated cottoncake-meal and maize-meal per head per day; this mixed meal, I am inclined to think, will do fattening sheep more good than either meal by itself. The reason why cotton-cake did not produce so large an increase in the live-weight of sheep that fed-off the clover-seeds in 1879 as in the previous year, and did not stand so good a comparison this year with maize as last year, I believe has to be sought in the unhealthy condition of some of the sheep in the cotton-cake lot. Several were badly affected by foot-rot, and made little flesh for some time, and one suffering from a bad mouth and foot-rot lost 18¾ lbs. in five weeks.

It should be borne in mind that these experiments were not instituted for the purpose of fattening sheep in the most profitable manner on clover-seeds, but with the intention of passing through them and incorporating with the land two descriptions of purchased food differing widely in composition, decorticated cotton-cake being a highly nitrogenous food and maize-meal comparatively poor in nitrogenous compounds, as will be seen by the following analyses of samples of the cake and maize actually consumed in these experiments:—

COMPOSITION of DECORTICATED COTTON-CAKE and MAIZE-MEAL used in the WOBURN EXPERIMENTS, 1879.

	Decorticated Cotton-cake.	Maize-Meal.
Moisture	8·49	15·01
Oil	15·83	1·88
Albuminous compounds	42·16	8·60
Mucilage, sugar, and digestible fibre	17·61	71·20 (Chiefly starch)
Woody fibre (cellulose)	8·46	1·56
Mineral matter (ash)	7·45	1·75
	100·00	100·00
Containing nitrogen	6·73	1·37

Rotation No. 3.—1878, seeds; 1879, wheat; 1880, roots; 1881, barley.

Wheat, 1879.—The seeds were fed off in 1878 by ten sheep kept on each of the four acres of this Rotation. On plot 1 the sheep consumed as additional food 672 lbs. of decorticated cotton-cake. On plot 2 they consumed 728 lbs. of maize-meal. On plots 3 and 4 no additional food was given; but on plot 3 the wheat was manured with artificial manures, containing as much nitrogen and other fertilising constituents as the manure from 672 lbs. of decorticated cotton-cake, namely, 275 lbs. of nitrate of soda, 73 lbs. bone-ash made into superphosphate, 45½ lbs. sulphate of potash, and 47½ lbs. of sulphate of magnesia. And lastly, on the fourth acre (plot 4) the wheat was manured with artificial manures containing as much nitrogen and other fertilising matters as the manure from 728 lbs. of maize-meal, namely, 58½ lbs. of nitrate of soda, 11¾ lbs. of bone-ash made into superphosphate, 5 lbs. of sulphate of potash, and 8 lbs. of sulphate of magnesia.

The same kind of wheat which was sown in 1877—Browick wheat—was sown on the 2nd of November, 1878, and the artificial manures were applied as top-dressings on the 10th of March, 1879. Although the seed went into the land when it was in capital condition, the cold weather—November and December—prevented the plant pushing through the soil for two months, for it was not before the 1st of January, 1879, that the wheat came up.

The four acres of Rotation wheat were cut on the 13th of September, or just about one month later than in 1878, carted and stacked on the 3rd and 4th of October, and threshed out in the field in the beginning of November 1879. The straw and chaff were weighed in the field at the time of threshing, and the corn was kept in labelled bags until the 19th of November, when it was weighed, and the total weight checked by measuring the number of bushels, and weighing each bushel.

The table on page 146 shows the results obtained.

Nothwithstanding the distressing season, the wheat on all the four Rotation acres, it will be seen, produced a full crop. Throughout the season the wheat looked splendid, and promised a very heavy crop, but towards harvest it became evident that the corn would not come to perfection for want of sun and heat.

There is not much difference in the yield of corn on each of the Rotation acres, nor does the bushel of wheat differ much, whether grown with or without artificials. The corn was light, weighing only from 53½ lbs. to 54½ lbs. per bushel. Nitrate of soda applied as a top-dressing on plot 3 in a proportion equivalent to the nitrogen contained in the manure resulting from the consumption of 672 lbs. of decorticated cotton-cake on plot 1, produced only 1½ bushel more head-corn and a few pounds more tail-wheat than the wheat on plot 1; whilst the smaller dose of nitrate of soda used as a top-dressing on plot 4, containing an amount of nitrogen equal to that of the manure resulting from the consumption by sheep of 728 lbs. of maize-meal, yielded about 2 bushels more head-corn than the wheat on plot 2 (the maize plot).

On looking carefully over the tabulated results (p. 146) it will be noticed that the application of nitrate of soda on plots 3 and 4, and more especially on plot 3, resulted in a very large quantity of straw. On all four acres, I would remark, more straw and less corn were produced in 1879 than in 1878; but, as the wheat was very strong, the four Rotation acres would have yielded very heavy wheat crops if sunshine and heat had brought the corn to perfection.

On plot 3, it will be seen, no less than 3 tons 4 cwts. 18 lbs. of straw and chaff were produced, or about 11 cwts. more than on plot 1 (cotton-cake plot). The cost of the artificial manures used on plot 3 amounted to 2*l.* 18*s.*, and on plot 4 to 11*s.*

Rotation No. 4.—Four acres: 1878, roots; 1879, barley; 1880, seeds; 1881, wheat.

Barley, 1879.—The mangolds in 1878 were grown on:

Plot 1. With dung, made from 1728 lbs. of straw as litter, 5000 lbs. mangolds, 1250 lbs. wheat-straw chaff, and 1000 lbs. of decorticated cotton-cake.

ROTATION WHEAT. PRODUCE OF ROTATION NO. 3, IN 1879, AFTER SEEDS FED ON THE LAND IN 1878.

PLOTS of One Acre.		DRESSED CORN.						Straw, Chaff, &c.
		Head-Wheat.			Tail-Wheat.			
		Weight.	Bushels.	Weight per Bushel.	Weight.	Bushels.	Weight per Bushel.	
		cwts. qrs. lbs.		lbs.	cwts. qrs. lbs.		lbs.	tons. cwts. qrs. lbs.
1	Seeds fed off by sheep, which consumed 672 lbs. of decorticated cotton-cake ..	17 1 18½	36·4	53·4	1 1 15¼	3·4	49	2 12 3 17¾
2	Seeds fed off by sheep, which consumed 728 lbs. of maize-meal	17 0 23½	35·5	54¼	2 0 7	4·5	51	2 14 3 15½
3	Seeds fed off by sheep without cake or corn, top-dressed in spring with artificial manures, containing as much nitrogen, potash, phosphoric-acid, &c., as 672 lbs. of decorticated cotton-cake	18 0 27½	37·9	54	2 0 6	4·8	48	3 4 0 18
4	Fed off by sheep without cake or corn, top-dressed in spring with artificial manures, containing as much fertilising matter as the dung from 728 lbs. of maize-meal	18 1 9½	37·7	54½	1 3 12½	4·	51	2 18 2 27

ROTATION BARLEY. PRODUCE OF ROTATION No. 2, IN 1879, AFTER MANGOLDS FED ON THE LAND.

PLOTS of One Acre.		DRESSED CORN.						Straw, Chaff, &c.
		Head-Corn.			Tail-Corn.			
		Weight.	Bushels.	Weight per Bushel.	Weight.	Bushels.	Weight per Bushel.	
		cwts. qrs. lbs.		lbs.	cwts. qrs. lbs,		lbs.	tons. cwts. qrs. lbs.
1	Without artificials (cotton-cake plot) ..	17 2 4	38	51·8	0 0 27¼	..	74	1 7 0 16
2	Without artificials (maize plot)	18 3 13½	40·6	52	0 0 23½	..	..	1 9 1 5
3	With artificial manure, containing one-third as much nitrogen as the manure from 1000 lbs. decorticated cotton-cake, namely, 124 lbs. nitrate of soda	18 2 23¾	40·3	52	2 0 11¼	5·4	43½	1 8 3 7
	Without artificial manure	14 3 14¾	31·44	53	0 2 3	1·4	40½	1 3 2 24

Plot 2. With dung, made from 1728 lbs. of straw as litter, 5000 lbs. mangolds, 1250 lbs. wheat-straw chaff, and 1000 lbs. of maize-meal.

Plot 3. With dung, made from 1728 lbs. of straw as litter, 5000 lbs. mangolds, 1250 lbs. wheat-straw chaff, and artificial manure containing two-thirds as much nitrogen and other constituents of the manure from 1000 lbs. decorticated cotton-cake, namely, 248 lbs. nitrate of soda, 100 lbs. bone-ash (made into superphosphate), 62½ lbs. sulphate of potash, and 65 lbs. sulphate of magnesia.

Plot 4. With dung, made from 1728 lbs. of straw as litter, 5000 lbs. mangolds, 1250 lbs. wheat-straw chaff, and artificial manure containing as much nitrogen and other constituents as the manure from 1000 lbs. maize-meal, namely, 80 lbs. of nitrate of soda, 16¼ lbs. bone-ash (made into superphosphate), 7 lbs. of sulphate of potash, and 11 lbs. sulphate of magnesia.

The succeeding barley on plots 1, 2, and 4 was grown without artificial manure; on plot 3 with artificial manure containing one-third as much nitrogen as the manure from 1000 lbs. decorticated cotton-cake, namely, 124 lbs. of nitrate of soda, applied as a top-dressing in May. The barley was drilled in at the rate of 9 pecks per acre on the 7th and 8th of April, 1879, and the crop was cut on the 15th of September, carted and stacked between the 4th and 7th of October, and threshed in the first week of November, when the straw and chaff were weighed at once in the field, and the corn was placed in carefully labelled bags in the granary. The corn was weighed and measured on the 19th of November, 1879, and the results were obtained as shown in the table on page 147.

It will be seen that the barley-crop on plot 1, after mangolds, manured with dung from 1000 lbs. of decorticated cotton-cake, produced about 2½ bushels less corn than on plot 2, which was manured with dung resulting from the consumption of 1000 lbs. of maize-meal. The difference is not great, but inasmuch as decorticated cotton-cake contains much more nitrogen than maize, and furnishes a richer dung than the latter, I naturally expected that the barley-crop would turn out better on plot 1 than on plot 2. The actual results did not fulfil this expectation, and I can only account for this somewhat unexpected result by the fact that during the past very wet season we had at times heavy thunder-storms and heavy rains, in consequence of which the water flowed towards the lowest end of the experimental field, and stood occasionally for some time upon a part of the acre of barley grown after mangolds manured with dung from decorticated cotton-cake.

The nitrate of soda on plot 3 does not appear to have had such a beneficial effect in 1879 as in the preceding year. T barley, it will be noticed, weighed nearly as much per bush as the wheat. Considering the bad season, both the Rotatio wheat and the Rotation-barley grown on the light Woburn la were fine crops, far exceeding the average produce of corn grow in England in 1879.

VII.—*An Experiment on the Comparative Value of Linsee cake and a Mixture of Decorticated Cotton-cake and Maize-me for fattening Bullocks.* By Dr. Augustus Voelcker, F.R. Consulting Chemist to the Royal Agricultural Society.

On the 3rd of October, eight bullocks (Herefords) were put the feeding-boxes for the purpose of making the requisite qua tity of manure for the experiments on the continuous growth wheat and barley.

The bullocks, in addition to white turnips and straw-cha received decorticated cotton-cake and maize-meal. They we removed from the boxes on the 9th of November, and as th were in good condition, it occurred to me to try a fattening expe ment, with a view of ascertaining whether it is more profitable give linseed-cake to fattening-bullocks, in addition to roots a chaff, or a mixture of maize and decorticated cotton-cake.

The same eight bullocks were again put into the feedin boxes, after having been weighed on November the 9th, 187 All were fed upon the same allowance—white turnips, swed and chaff—in addition to which four bullocks received Indi corn-meal and decorticated cotton-cake, in equal proportio and four bullocks linseed-cake. The bullocks were aga weighed on the 17th of December, and for the last time on t 17th of January, 1879. Between the 9th of November, 1878, a the 17th of January, 1879, one lot of four bullocks consumed :

Tons.	cwts.	qrs.	lbs.	
0	16	3	4	of Wheat Chaff.
0	10	0	0	of White Turnips.
4	7	2	0	of Swedish Turnips.
0	18	3	24	of Decorticated Cotton-cake.
And 0	19	1	20	of Maize-meal.

The second lot during the same period consumed the sa amount of roots and straw, namely :—

Tons.	cwts.	qrs.	lbs.	
0	16	3	4	of Wheat Chaff as food.
0	10	0	0	of White Turnips.
4	7	2	0	of Swedes.
And 1	14	1	5	of Linseed-cake.

Each lot had an allowance for litter of 1 ton 19 cwts. and 1 qr. of wheat-straw, cut into chaff about 2 inches long.

The following table shows the composition of the three kinds of purchased food used in this experiment:—

	Composition of		
	Decorticated Cotton-cake.	Linseed-cake (American-cake).	Maize-meal.
Moisture..	8·58	10·89	15·01
Oil	14·86	9·86	1·88
Albuminous compounds	43·06	29·87	8·60
Mucilage, sugar, and digestible fibre	16·32	34·33	71·20 (Starch).
Woody fibre (cellulose)	9·60	8·25	1·56
Mineral matter (ash)	7·58	6·80	1·75
	100·00	100·00	100·00
Containing nitrogen	6·89	4·78	1·37

The next table shows the weight of the eight bullocks when put into the feeding-boxes on the 17th of December, 1878, and the increase in live-weight of each bullock during that period:—

Bullocks.		Weight of Bullocks on the 9th November, 1878.			Weight of Bullocks on the 17th December, 1879.			Increase in Live-Weight.		
		Cwts.	qrs.	lbs.	Cwts.	qrs.	lbs.	Cwts.	qrs.	lbs.
Fed on Decorticated Cotton-cake and Maize-meal.	No. 1 ..	9	1	23	10	0	26	0	3	3
	„ 2 ..	9	2	3	10	3	2	1	0	27
	„ 3 ..	10	3	0	11	0	19	0	1	19
	„ 4 ..	9	3	2	10	1	7	0	2	5
Total weight of 4 Bullocks		39	2	0	42	1	26	2	3	26
Fed on Linseed-cake.	No. 5 ..	10	0	19	11	0	14	0	3	23
	„ 6 ..	10	0	17	10	3	14	0	2	25
	„ 7 ..	9	2	15	10	0	1	0	1	14
	„ 8 ..	10	2	19	11	0	26	0	2	7
Total weight of 4 Bullocks		40	2	14	43	0	27	2	2	13

It will be seen that the mixed cotton-cake and maize-meal gave a little more increase than the linseed-cake.

The bullocks were again weighed on the 17th of January, and then sold off to the butcher.

Their weights on the 9th of November, 1878, when put up, and on the 17th of January, when ready for the butcher, were the following:—

Bullocks.		Weight of Bullocks on the 9th November, 1878.			Weight of Bullocks on the 17th January, 1879.			Increase in Live-Weight.		
		Cwts.	qrs.	lbs.	Cwts.	qrs.	lbs.	Cwts.	qrs.	lbs.
Fed on Decorticated Cotton-cake and Maize-meal.	No. 1 ..	9	1	23	10	3	17	1	1	22
	„ 2 ..	9	2	3	11	2	16	2	0	13
	„ 3 ..	10	3	0	11	3	5	1	0	5
	„ 4 ..	9	3	2	10	3	14	1	0	12
Total weight of 4 Bullocks		39	2	0	45	0	24	5	2	24
Fed on Linseed-cake.	No. 5 ..	10	0	19	11	3	9	1	2	18
	„ 6 ..	10	0	17	11	2	18	1	2	1
	„ 7 ..	9	2	15	10	2	18	1	0	3
	„ 8 ..	10	2	19	12	0	14	1	1	23
Total weight of 4 Bullocks		40	2	14	46	1	3	5	2	17

There is only a difference of 7 lbs. in the increase of live-weight of the two sets of bullocks, and it may therefore be stated that in this experiment the mixed maize-meal and decorticated cotton-cake produced as much increase in the weight of the bullocks as linseed-cake. Both sets of bullocks were supplied with the same amount of roots and straw-chaff as food. If we inquire into the extra expense for purchased food in helping to produce the increase in live-weight, it will be found from the subjoined particulars that in the case of the bullocks which had decorticated cotton-cake and maize-meal, the lb. of live-weight cost on an average 5⅛*d.* in cake and corn, whilst the increase cost 6¼*d.* per lb. in the case of the four bullocks fed on linseed-cake.

Fattening Experiments upon 8 *Bullocks, begun Nov.* 9*th*, 1878, *finished Jan.* 17*th*, 1879.

	Ton.	cwts.	qrs.	lbs.		£	*s.*	*d.*		£	*s.*	*d.*
Decorticated Cotton-cake used in the Experiment	0	18	3	24	at	7	15	0	per ton =	7	6	10
Maize-meal	0	19	1	20	„	6	12	6	„ =	6	8	8
										£13	15	6
Linseed-cake eaten by 4 Bullocks	1	14	1	5	„	9	10	0	„	£16	5	10

The cost of the purchased food thus was 2*l.* 10*s.* 4*d.* less in the case of the four bullocks fed on decorticated cotton-cake and maize-meal than in the case of the four bullocks which had linseed cake as an additional food.

Some of the bullocks did much better than others, as will be seen by the following particulars:—

Bullocks.		Increase in Weight between November 9, 1878, and January 17, 1879.	At a Cost in Purchased Food.	
		lbs.	Per lb.	
Fed on Decorticated Cotton-cake and Maize-meal.	No. 1 ..	162	$5\frac{1}{16}$	Showing an Average of $5\frac{1}{8}$*d.* per lb.
	„ 2 ..	237	$3\frac{7}{16}$	
	„ 3 ..	117	7*d.*	
	„ 4 ..	124	$6\frac{1}{2}$*d.*	
	Total Increase ..	640		
Fed on Linseed-cake.	No. 5 ..	186	$5\frac{1}{4}$*d.*	Showing an Average of $6\frac{1}{4}$*d.* per lb.
	„ 6 ..	169	$5\frac{3}{4}$*d.*	
	„ 7 ..	115	$8\frac{1}{2}$*d.*	
	„ 8 ..	163	6*d.*	
	Total Increase ..	633		

VIII.—*On the Comparative Value of Soluble and Insoluble Phosphates.* By Dr. Augustus Voelcker, F.R.S.

A good deal of attention has lately been directed to a series of experiments which for some years past have been carried out in Aberdeenshire with a view of finding out the most suitable and economical manure for raising a crop of swedes.

The results of these field-experiments apparently tend to show that mineral-phosphates in a finely ground condition are but little less efficacious than after treatment with sulphuric acid, and that it is more economical to manure root-crops with finely ground coprolites, and other kinds of mineral-phosphates, than with superphosphate made from these materials. If this practical recommendation which Mr. Jamieson has given to turnip-growers is based on experiments to which no objection can be taken, and if other experimenters in the main arrive at the same conclusions as Mr. Jamieson, it is clear that for the last twenty-five or thirty years agriculturists have been altogether wrong in applying superphosphate to their root-crops instead of the ground raw materials from which it is produced; and that the manufacture of superphosphate, in which millions of pounds sterling are embarked, has been established on unsound principles, and carried on for more than twenty-five years to the disadvantage of the farmer.

It is not my intention to make any critical remarks on Mr. Jamieson's field-experiments, nor to controvert his bold assertion that the results of the Aberdeenshire field-experiments will cause a complete revolution in the manufacture of artificial manures; but I propose simply to direct attention to a few published experiments which are diametrically opposed in their results to those which Mr. Jamieson has obtained, and which conclusively prove the economy and beneficial effects of dissolved phosphatic manures in comparison with the raw materials from which they are manufactured. It will be admitted by all persons that, in order to be food for plants, phosphate of lime, like other constituents of plant-food, must be soluble to some extent in water, or in the liquid which passes through the medium of the root into the plant. Although we are in the habit of speaking of insoluble phosphate of lime, no phosphate of lime, not even the hardest and most crystalline variety, is absolutely insoluble in water, especially when the water is charged with more or less carbonic acid. Some of the beds of the Lower Chalk formation, and certain marls in the Greensand formation, it is well known, are more efficacious fertilisers than the chalk and marls in the Upper Chalk formation, mainly because they contain more or less considerable proportions of phosphate of lime, of which no appreciable quantities occur in the latter formation. There cannot be any question about the fact that, in the shape of marl or chalk, mineral phosphate of lime is soluble in water charged with carbonic acid, and that phosphatic marls and chalk are better fertilisers than marls or chalk in which phosphate of lime is absent, or present only in minute proportions. I do not therefore deny for a moment that insoluble mineral phosphate of lime has fertilising properties. It will also be admitted that the more finely the phosphate of lime is divided, the more easily it will be acted upon by water; or, in other words, that in a finely divided state phosphate of lime is soluble to a greater extent in water, and is more efficacious as a manuring agent than in a coarser state of division.

In a paper published by me in 1868, in the 'Journal of the Royal Agricultural Society,' on the "Solubility of Phosphatic Materials," I gave experimental evidence of the varying degree of solubility of various forms in which phosphate of lime occurs in coarse and fine bone-dust; in Peruvian and phosphatic guanos; in bone-ash and porous mineral-phosphates; in coprolites; in different kinds of hard and crystalline phosphatic minerals, and in precipitated phosphate of lime. Thus, I showed that a given quantity of water dissolves more phosphate of lime from fine than from coarse bone-dust; that more phosphate of lime is taken up by a given quantity of water from bone-dust than from bone-ash, more from phosphatic guano than from coprolite powder, and more from the latter than from apatite and other crystalline mineral phosphates.

Further, that insoluble phosphate of lime, obtained by precipitation from its solution, is much more soluble in water than phosphate of lime in the shape of the finest bone-meal or bone-ash; and that, recently precipitated, it is very voluminous, and in that state about four times as soluble in water as it is after it has been dried and heated.

The greater efficacy of the phosphate of lime as a manure in bones in comparison with coprolite powder entirely depends upon its finer state of aggregation, and consequently upon its greater solubility in the form of bone-dust.

The general experience of the best farmers during the last twenty-five or thirty years has shown most clearly that dissolved bone-dust is a more efficacious and more economical manure for root-crops than raw bone-dust or even fine bone-meal. As treatment with acid increases the efficacy of bone-dust, it is evident that the same treatment must render more efficacious coprolites and other mineral phosphates, which, in the shape of the finest powder in which they can be obtained by mechanical means, are far less soluble than bone-dust.

The whole secret of the energetic action of superphosphate depends upon the production of most minutely subdivided or precipitated insoluble phosphate of lime within the soil itself, and not, as is erroneously supposed by some, on the direct absorption of soluble phosphates by plants. All soils have the power of precipitating, more or less rapidly, soluble phosphate from its solution; but whilst some, like all soils rich in lime, effect the precipitation with rapidity, others, deficient in lime or other basic elements, only gradually change the soluble into insoluble precipitated phosphate of lime. As this change must take place before the phosphate can be useful to the growing plant, and as even minute quantities of free acid are injurious to the healthy growth of all plants, we can well understand why, on soils deficient in lime or other bases, a very acid superphosphate, although rich in soluble phosphate, has a less beneficial effect upon root-crops than a mineral superphosphate which is poor in acid soluble phosphate of lime. By treatment with acid, the hard and difficultly soluble phosphates in coprolites and other phosphatic minerals are rendered soluble in water in the first place, and afterwards obtained as precipitated phosphates in an insoluble form within the soil itself. Insoluble phosphates in a precipitated condition are not only greatly more bulky than in the form of the finest powder which can be obtained by mechanical means, but are also more soluble in water than merely powdered phosphate of lime. In consequence of this voluminous and extremely fine state of division in which phosphate of lime is precipitated in the soil, the application of a few hundredweight of superphosphate per acre in most cases answers better and is more economical than two or three tons of a phosphatic marl, or half a ton of coprolite powder. Nevertheless there are, no doubt, soils upon which marl may be applied with greater advantage than superphosphate, and there are others upon which fine bone-dust, or bone-dust treated with a little acid and only partly rendered soluble, is a more suitable manure for roots than dissolved bones rich in soluble phosphate. The question under discussion, however, is not what is the best manure for root-crops on various kinds of soils, but is it good or bad economy to treat phosphatic materials with acid? or, in other words, to manufacture them into superphosphate or to apply them in a raw state to the land.

It can scarcely be imagined that all the many farmers who have applied, year after year for more than twenty years, dissolved bones or superphosphate as a manure for turnips and other root-crops can have been mistaken in considering it true economy to use these manures in preference to undissolved bones.

The earliest notice of the great discovery, as the late Mr. Pusey called the treatment of bones with acid, and the use of dissolved bones in agriculture, occurs in vol. iv. of the 'Journal' of the Society for 1843, in a "Report by the Committee of the Morayshire Farmers' Club appointed to inspect and report on the Experiments made in rearing Turnips by means of Sulphuric acid and Bone-dust," communicated by the Duke of Richmond.

Amongst other particulars, I find recorded that raw bone-dust alone, applied at an expense of 38*s.* per acre, produced 11 tons 9 cwts. 21$\frac{5}{7}$ lbs. of turnips per acre; whilst bone-dust, treated with sulphuric-acid, and applied at a cost of 17*s.* 6*d.* per acre, produced 13 tons 10 cwts. 21$\frac{6}{7}$ lbs. of turnips. Similarly, satisfactory results by the use of dissolved bones were obtained in 1844 and 1845 by Mr. Williams, Mr. Geddes, and Dr. Monson, and reported to the Morayshire Farmers' Club, in experiments by Mr. Fleming of Boachan, Paisley; in others by Mr. Finnie of Swanston; and especially in the trials by Mr. Hannam, to whom the Council of our Society awarded a prize for his admirably well-conducted field-experiments, and the able and interesting Report which will be found in vol. v. 1845, "On the Action and Application of Dissolved Bones. By John Hannam."

Mr. Hannam's experiments were tried on plots of one-tenth of an acre each, with rough and fine bones, raw and dissolved; with boiled bones, raw and dissolved; and with bone-ash merely powdered and treated with acid.

To quote a few of his results:—6 cwts. of raw bones, crushed, have produced 10 tons 3 cwts. 4 stone of turnips: 3 cwts. of raw bones, dissolved in 1½ cwt. of acid, produced 16 tons 1 cwt. 3 stone 6 lbs.: 1½ cwt. of raw bones, dissolved in ¾ cwt. of acid, produced 12 tons 11 cwts. 3 stone 6 lbs.

Still more to the point are his experiments with the mineral portion of bones dissolved and undissolved:—3¼ cwts. of ground bone-ash produced 9 tons 7 cwts. 4 stone: 1¾ cwt. of ground bone-ash, dissolved in 1½ cwt. of acid, produced 14 tons 3 cwt. 7 stone 6 lbs. of turnips.

In experiments on the use of raw and dissolved bones on the Duke of Richmond's Home Farm, Gordon Castle, the following results were obtained:—

Sixteen bushels of bones, at a cost of 1*l.* 16*s.* per acre, produced 11 tons of turnips; and the following year, 3 qrs. 7 bushels 1½ peck of barley.

Two bushels of bones and 83 lbs. of sulphuric acid, at a cost of 11*s.* 6*d.* per acre, applied with the liquid-manure drill, produced 12 tons and 4 cwts. of turnips, and the following year, 3 qrs. 4 bushels 3 pecks of barley.

In experiments by Mr. R. W. Purchas, tried in Gloucestershire, in 1843, 3½ bushels of bone-dust and 80 lbs. of sulphuric acid, costing 1*l.* 0*s.* 6*d.* per acre, produced 13 tons 1 cwt. 1 qr. turnips; and 16 bushels of bones (half dust), costing 2*l.* 4*s.* per acre, produced 8 tons 2 cwts. 2 lbs. of turnips; and 20 bushels of bones, costing 2*l.* 14*s.* per acre, produced 9 tons 1 cwt. 1 qr. of turnips. The field manured with bones and sulphuric acid in 1843 was planted in 1845 with carrots. The part manured with acid and bones at a cost of 1*l.* 0*s.* 6*d.* per acre, produced 24¼ cwt. per acre more than the part manured with 20 bushels of bones at a cost of 2*l.* 14*s.* per acre.

In a series of experiments which I tried in 1855, '56, '57, '58, and '59, at Cirencester, I obtained similar results. Thus, 7 cwts. and 16 lbs. of bone-dust, at a cost of 2*l.* per acre, produced 8 tons 16 cwts. of swedes; and bone-dust, dissolved in one-third its weight of acid, applied at the same cost (2*l.*) per acre, produced 13 tons 12 cwts. 16 lbs. of swedes; and dissolved coprolites, 11 tons 12 cwts. of swedes; and no manure gave 5 tons 4 cwts.

In another trial in 1859, I obtained with 3 cwts. of a purely mineral superphosphate, 20 tons 15 cwt. 2 qrs. 24 lbs. of swedes per acre, or an increase of 6 tons 1 cwt. 1 qr. 20 lbs. over the unmanured plot.

In vol. vi. of the 'Journal of the Royal Agricultural Society,' Dr. Daubeny records experiments with ground Spanish phosphorite and dissolved phosphorite:—12 cwts. of ground phosphorite per acre produced 28,639 lbs. of turnips; and 12 cwts. of Spanish phosphorite, treated with acid, produced 30,869 lbs.

As far back as 1844 Mr. G. B. Lawes experimented at Rothamsted on the comparative efficacy of ground mineral phosphates, and the same material decomposed and rendered soluble by sulphuric acid. A detailed account of these results will be found in vol. viii. part ii. of the 'Journal of the Royal Agricultural Society of England.' Mr. Lawes records in this paper three experiments which appear to me to prove conclusively the vastly superior efficacy of dissolved mineral phosphates in comparison with the same materials not treated with acid and merely ground.

	Tons.	cwts.	qrs.	
No. 1. 3 cwts. of ground apatite (a mineral phosphate) gave	3	1	0	of turnips.
No. 2. 3 cwts. of superphosphate, made from 2 cwts. of apatite and decomposed by acid, gave	6	15	3	„
No. 3. 270 lbs. of apatite and 104 lbs. of sulphuric acid, gave	7	14	3	„

In Mr. Lawes' experiments made in 1845, the produce of turnips also was larger in the case of bone-ash treated with sulphuric acid than with ground bone-ash. Thus, 400 lbs. calcined bone-dust produced 10 tons 4 cwts. of white turnips; and 400 lbs. calcined bone-dust with 268 lbs. sulphuric acid gave 13 tons 11 cwts. of white turnips.

Sir Harry Verney also made experiments with ground and dissolved Spanish phosphorite, in 1855, on barley. Nothing gave 3 qrs. 6 bushels 2 pecks of barley. Undissolved Spanish phosphorite, at a cost of 18*s*. per acre, produced 5 qrs. 3 bushels 2 pecks of barley; and Spanish phosphorite and acid, at the same cost, yielded 6 qrs. 3 bushels 2 pecks of barley.

Mr. Hannam winds up his account of numerous experiments with raw and dissolved bones as follows:—

"The general advantages arising from the use of dissolved bones instead of ordinary bone-dust are:

"1. Great saving in the cost of the application.
"2. A gain in the greatly augmented produce.
"3. A crop which grows so quickly that the fly and other enemies of the turnip-infancy cannot affect it so seriously as in ordinary cases.

"4. A crop with so early a tendency to form bulbs that it affords us the means, by sowing early, of getting an early crop for autumnal feeding; or, by sowing late, of securing a crop when no other known means could effect it, and when our land, owing to peculiar circumstances, has not been fit for the seed at an earlier period."

"The fertilising influence of the bones will be quadrupled. The various circumstances under which the several applications which support this conclusion were tried, *without one contradictory result*, place that conclusion beyond the possibility of error, and justify us in asserting that practice has realised what theory previously promised in the most important saving which has ever been held out in the use of manure."

The experience of farmers in all parts of the world has since fully confirmed the correctness of Mr. Hannam's conclusions, and it appears to me both an irrational and a retrograde step if agriculturists were to attempt the use of raw phosphatic minerals instead of applying them treated with acid.

Briefly stated, the following are my views on the comparative efficacy of different kinds of phosphatic materials and the economy of applying them to the land, either in a raw state or after treatment with acid:—

1. Acid or soluble phosphate is not usefully taken up as such by plants, and has to become insoluble in the soil before it can become plant-food.
2. The efficacy of insoluble phosphate of lime as a fertilising ingredient rises or falls with the more or less finely divided state in which it occurs in various phosphatic materials.
3. The finer the state of division of the particles of phosphate of lime in phosphatic materials the more readily it is soluble in water, and the more efficacious are the phosphatic materials as manure. Therefore coarsely ground coprolites and other phosphatic minerals are less soluble and less efficacious than in a state of fine powder.
4. In porous soft bones the phosphate of lime occurs in a different state of aggregation than in hard bones, and in the former condition phosphate is more soluble and efficacious than in the latter, and for the same reason the phosphate of lime in fine bone-dust is more soluble in water and more efficacious than the phosphate of lime in ½-inch bones or coarse bone-dust.
5. In the form of hard crystalline phosphate of lime,

mineral phosphates—such as Norwegian, Canadian, and Spanish apatite—are less soluble than in the shape of porous phosphatic materials, such as certain kinds of phosphatic guano and semi-fossilized rock-guano, for the simple reason that the particles of phosphate of lime are more finely divided, and in every case more soluble in water in the more porous materials than in crystalline hard materials.

6. By treatment with acid the phosphate of lime in phosphatic materials is rendered perfectly soluble in water, and on the application of dissolved phosphatic materials (superphosphate) to the soil, the soluble phosphate contained in the superphosphate is precipitated and rendered insoluble by contact with the soil.
7. In this precipitated condition insoluble phosphate of lime is infinitely more finely divided, and in consequence greatly more efficacious, than in the finest state in which the raw materials used by makers of superphosphate can be obtained by mechanical means.
8. In my judgment, chemical treatment with acid is the most economical and best plan of utilising mineral phosphates for agricultural purposes.

To persons wishing to institute practical experiments relating to this matter, I would recommend the following scheme in duplicate experiments :—

General Scheme of Swede Trials, One-fourth of an Acre.

1. 4 cwts. dissolved coprolites (containing 25 per cent. soluble phosphates), costing about 1*l.* per acre.
2. 6 cwts. raw coprolites finely powdered, at a cost of about 1*l.* per acre.
3. 2½ cwts. fine bone-meal .. .. .. " "
4. 3 cwts. dissolved bone-meal .. .. " "
5. 3 cwts. precipitated phosphate of lime " "
6. Nothing.
7. 6 cwts. of Redonda phosphate finely ground (a native phosphate of alumina and iron) " "
8. Rotten dung, 20 tons .. .. " "
9. Rotten dung, 10 tons, and 4 cwts. dissolved coprolites .. .. " "
10. Rotten dung, 10 tons, and 6 cwts. of coprolite powder, per acre.
11. Chalk, at the rate of 5 tons per acre.

Each experimental plot should not be less than 1-4th of an acre. Swedes to be the experimental crop ; on one plot 4 cwt. per acre of superphosphate, containing 25 per cent. of soluble phosphate (dissolved coprolites), costing about 1*l.* per acre, is to be applied, and to the other manured plots various phosphatic fertilisers, likewise at a cost of about 1*l.* per acre in every case.

IX.—*On the Composition of Cream and Skim-milk obtained by De Laval's Centrifugal Cream-separator.* By Dr. AUGUSTUS VOELCKER, F.R.S.

DURING the Exhibition at Kilburn I had an opportunity of ascertaining the composition of the cream and skim-milk which were obtained in the Kilburn trials with De Laval's centrifugal cream-separator, and as the results of my analyses are of some interest to dairymen, they may be briefly recorded in the 'Journal of the Royal Agricultural Society.'

The following is the composition of the milk used in the Kilburn trials on the 4th of July, 1879, and of a sample of the skim-milk produced by Laval's cream-separator.

	New Milk.	Skim-milk from Laval's Cream-Separator.
Water	87·72	90·71
Butter-fat	3·45	·22
*Casein	3·12	3·31
Milk-sugar	5·11	5·12
Mineral matter (ash)	·60	·64
	100·00	100·00
* Containing nitrogen	·50	·53

Milk well skimmed in the ordinary manner contains on an average about ¾ per cent. of butter-fat, whereas the skim-milk obtained in Laval's cream-separator did not retain quite ¼ per cent.

Thus of the 3½ per cent. of butter-fat (in round numbers) 3¼ per cent. were obtained in the cream, and only ¼ per cent. of fat passed into the skim-milk, affording a striking proof of the perfect manner in which the butter-forming constituents are separated from milk in passing through Laval's rotatory machine.

Had the milk been set in pans and skimmed thoroughly in the usual manner, instead of 3¼ per cent. of pure butter-fat only 2¾ per cent. would have been obtained from the new milk; or, in other words, by Laval's separator 93 per cent. of the butter-fat were obtained in the cream and 7 per cent. only left in the skim-milk; whilst by the usual plan of skimming only 78½ per cent. of the butter-fat of milk passes into the cream, and 21½ per cent. remain in the skim-milk.

In another trial at Kilburn on the 8th of July the separation of butter-fat from the milk was not so perfect as in the first trial, as will be seen by the following results, showing the composition of the skim-milk produced :—

Water	90·49
Butter-fat	0·46
*Casein	3·01
Milk-sugar	5·31
Mineral matter (ash)	0·73
	100·00
*Containing nitrogen	0·48

In the second trial it will be seen nearly ½ per cent. of fat was contained in the skim-milk.

The cream obtained by means of the separator had the following composition :—

Water	66·12
Butter-fat	27·69
*Casein	2·69
Milk-sugar	3·03
Mineral matter (ash)	0·47
	100·00
*Containing nitrogen	0·43

Good cream obtained in the ordinary way of skimming milk seldom contains as much as 25 per cent., and generally rather less, butter-fat; and quite as much casein as was contained in the cream from Laval's machine.

The Kilburn trials thus show that cream from milk which has been passed through Laval's separator is richer in butter-fat than that obtained in the usual manner.

On the occasion of the dairy show held last October at Islington, I had another opportunity of examining the skim-milk obtained by Laval's cream-separator. This sample had the following composition :—

Composition of Skim-milk obtained by Laval's Cream-Separator.

Water	90·82
Butter-fat	0·31
*Casein	3·31
Milk-sugar	4·77
Mineral matter (ash)	0·79
	100·00
*Containing nitrogen	0·53

Another portion of the same milk, after having been skimmed in the usual way, contained in 100 parts:—

Water	89·25
Butter-fat	1·12
*Casein	3·69
Milk-sugar	5·16
Mineral matter (ash)	0·78
	100·00
*Containing nitrogen	0·59

According to these trials nearly four times as much butter-fat was left in ordinary skim-milk as in the skim-milk obtained in Laval's cream-separator.

I may state that in these experiments the percentage of pure butter-fat was determined with great care, and the results were verified by appropriate checks.

X.—*Notes on a Report presented to the 'Société des Agriculteurs de France' by their Deputation to the Kilburn Exhibition.* By J. D. DENT, of Ribston, Wetherby.

THOSE members of our Council who had the pleasure of accompanying the deputations of foreign agriculturists last summer to Woburn, Rothamsted, and Windsor were anxious to know what impressions of England and her agriculture these gentlemen had formed. I have had the good fortune to read the report presented by M. Marc de Haut, with the assistance of his colleagues, MM. Julien de Felcourt, Tiersonnier, Vilmorin, and Caseneuve, to the Society of French Agriculturists. I propose to lay before our Members some comments on the Show and on English agriculture made by gentlemen so intelligent and observant as these French agriculturists undoubtedly were. The Report opens with a graceful recognition of the hospitable welcome which they received from our Society. Our French friends acknowledge the "exquisite courtesy" of Lord Vernon, the kindness of Mr. Jenkins and Mr. Pitman, and the hospitality of the Lord Mayor. They were charmed with the "princely domain of Woburn," the special train, the twenty-five carriages waiting for our polyglot party, preceded by an outrider 'en grande tenue;' the park of 2500 acres, the miles of grass drives, bordered by masses of rhododendrons in full flower, the gracious tact of their host, who pointed out the historic collections of his house with all the wit and finish of a Parisian; and finally, that wondrous ease with which his Grace welcomed his guests in a fluent speech commenced in French, continued in German, and concluded in English. Mr. Lawes' scientific experiments at Rothamsted, her gracious Majesty's welcome to Windsor, are all gratefully acknowledged; and the triumphant mud of Kilburn lost most of its discomforts under the interest of the whole Show and the smiles of the Princess of Wales and the three pretty children who accompanied her.

A very good and clear account of our regulations with respect to the importation of foreign cattle forms the next portion of the Report; and the following remarks on the regulations respecting French cattle appear to me worth record:—

"We will now only notice the second category, in which French animals are included. By this they must be landed at certain defined ports, and immediately confined to the dépôts where they are to be sold, and slaughtered within ten days. From these regulations two inconveniences arise.

"First, the choice of the market is restricted, and in consequence the importer is dependent upon the butchers who frequent these particular dépôts. Secondly, the cattle cannot be taken to stay in pastures in order to finish them off to the degree of fatness which the English consumer desires. In consequence of the stringency of these new regulations, as we were informed by the superintendent of these dépôts, and as we were already aware from statistics, the importation of French cattle to England has almost come to an end.

"However, we thought it our duty to visit some of these dépôts, and particularly the one in London, in order to form an opinion of their accommodation for cattle and their interior regulations. The manager, to whom we were referred by the head of the Veterinary Department in London, received us with the greatest courtesy, and went with us through a most minute and careful visit. This dépôt is situated at Deptford, on the Thames, and occupies some buildings formerly used as part of an arsenal for the royal navy. We must say that we found here a lairage quite perfect from every point of view—in space, ventilation, abundant supply of water, care and cleanliness, facility of debarkation, nothing was wanting. It will hold 3000 oxen and 14,000 sheep. The cost of lairage is 9*d.* for a sheep, 6*s.* for an ox for the whole time they are there. The owner pays for the food, and if it is not considered sufficient by the manager of the dépôt, he orders a further supply, and, to use the very words of the manager, exacts from the owner such a price for it that he is not tempted to expose himself to the charge a second time. We saw a cargo of sheep landed from a Hamburg vessel, the operation was very easily and quickly performed.

"At the time of our visit the depot contained a great number of sheep and some American oxen. The trade is so important that there are here two markets each week. At the last there were 5500 sheep sold. The director told us that he was expecting the arrival of about 2000 American oxen in nine ships, and that a still greater number were on their road to Liverpool.

"The measure which placed American cattle under the regulations for slaughter has not arrested their importation in the same manner as it has that of the French. We could only have found out if it had had the effect of slackening the importation by a comparison of the statistics of two periods, which we have been unable to do. We have been able to obtain the information, which we here insert, that the freight of cattle from New York to London varies from 65 francs to 100 francs each beast. The issue of the slaughtering regulation and the consequent provision of compulsory markets for American cattle has had the effect of increasing the importance of the London dépôt at the expense of that at Liverpool; and that we can easily imagine, because the London market is near the principal centre of consumption. If the French trade in cattle with England should again become active it is to Deptford that it must gravitate."

The quarantine station at Southampton does not appear to have impressed the foreign visitors so favourably. This is described as a small stable or shed of planks, without any troughs, and in which were half-a-dozen wretched Normandy heifers, separated from one another by hurdles.

Proceeding to the Show at Kilburn the writer seems to have been most impressed by our draught-horses, and disappointed with the hunters. He eulogises the high quality and the uniformity of breed and of shape of the draught-horses; and he seems struck by the desire of the Judges to reward the distinctive character of each breed, rather than some ideal standard of excellence in the animal itself. I fear the members of the English Cart-horse Society will not agree in his division of the draught-horses into three classes—Suffolks, Clydesdales, and those which belong to neither of these races, but appear to arise from crosses of all races.

The Suffolks are described as of immense height, heavy, slow, of a common type, and very like the Flemish. Their bulk is greater than their strength, their limbs not equal to their carcasses, only fit to draw drays, and of no use as crosses for French work. The Clydesdales approached more nearly the type which the French writer admired. He thinks them less over-done with fat, better shaped, with limbs clean, sound, and in better proportion to the body; which is short, thick set, and very powerful; the shoulders good, the action very free. They trotted lightly over the broken ground, and gave one the idea that many of them were capable of drawing waggons at a trot. In one class of Clydesdales (Class 6) one horse (No. 125), which was passed over with a mere mention by the Judges, as being smaller than some of the others, would make admirable crosses for the mares belonging to the Boulogne and Ardennes breeds.

With our English cart-horses the writer does not appear to have been so much impressed; he thinks that all the draught-horses were shown in a state of exaggerated fatness; a criticism which seems very well placed; and he concludes by saying, "To sum up, while admiring much the breeds of English draught-horses, we believe our French races are more useful for us, and more adapted to our wants, and that only in exceptional cases we need seek in England for stallions to cross with our own draught-horses, in order to give substance and compactness to some of the more loosely built breeds."

The hunting blood-mares he describes as exceptional in size, strength, and beauty; the stallions rather disappointed him, and I think he was not far wrong in describing the remaining classes of hunters as only moderate.

The roadsters are described as of a very fine type, short-legged, well coupled, with beautiful action, trotting with an ease and smoothness quite remarkable. From amongst these the French breeders are advised that they might make excellent selections to improve their half-bred horses, by infusing spirit, soundness of limb, especially in the hocks, which are generally weak points in French horses. The writer saw nothing prettier or more graceful than Mr. Wilson's ponies; their beautiful action and good manners, their strength and activity, which would enable them to carry an ordinary man, or rapidly draw a light carriage, appear to have equally delighted and astonished him. And from amongst these he is of opinion that the French breeder might make a wise selection for crossing the ponies of the Landes.

The docility and good manners of all the horses seem to have surprised the reporter, who contrasts the behaviour of horses of 4 or 5 years old preceding their grooms with a long loose rein, in fine form and perfect pace, with the disorderly and untrained horses of a French Show.

The reporter on the cattle appears equally delighted and impressed with the uniformity of the English breeds; but the only point of interest in his criticism seems to be that the Shorthorns took the prizes both in their own classes and also amongst the dairy-cattle; the explanation given to him was that in the race are two types, of which one is distinctively a milk-producing form. Amongst the sheep, not even the popular Shropshire can shake his admiration of the Southdown, which he describes as superb, and maintaining the first place for their perfect shape.

We need not go fully into the report on seeds, implements, and the waggons used for the carriage of meat, but a portion of the report on the use of feeding-stuffs and artificial manures will probably be of some interest.

"For some time the English farmers, paying higher than other nations for their land and labour, have recognised the necessity of getting heavier crops, and for that purpose of freely manuring the land with other materials than those produced from the farm itself, as is done by those cultivators who only use stable or farmyard-dung. Bone-dust or crushed bones, mineral phosphates, guanos, and other artificial manures, were employed in England before being generally introduced into other countries. Very soon came in the practice of treating phosphates with sulphuric acid, to render the phosphoric acid more readily available. This was making an advance to the land which could be repaid at once, and not by annual instalments.

"England in all its manufactories of manure has placed the whole world under contribution to enrich its soil, and hence it is that her crops of every kind are about a third more than are produced from an equal area in France. She obtains phosphates from our southern coasts, guanos from the Pacific, and bones from ancient burial-places, or distant fields of battle, such as Egypt.

"The trade in chemical manures is much larger in England than in France; though we have houses of equal scientific worth, and which conduct their business as well as any English establishments. It is in the ignorance of our cultivators that our inferiority in this respect exists. The French farmer, not knowing what an artificial manure should be, allows himself to be cheated; and, when he is cheated, he includes all the manufacturers and dealers in his abuse, which is as persistent as it is unreasonable. From cattle-food as well as manure England enriches her soil at the expense of other nations. The quantity of oil-cakes consumed in Great Britain is very large. The oil is produced without robbing the soil; it is not so with the other substances which are found in the fruit or grain from which oil is derived. All these tropical regions which export oil seeds or fruit send away a portion of their fertility. France retains a portion of it, as Marseilles is a great centre of the production of oil from seed; but the principal part of the cake manufactured there comes to England in the same way as the linseed-cakes from the departments of the north and north-west. England also largely manufactures oil from seeds, but retains the oil-cakes, besides importing from abroad about 100,000 tons a-year."

Glancing at the exhibition of seeds, the author thinks that our seedsmen, in their excessive rivalry, have gone much too far in their attempts to produce enormous roots. In the samples of grasses exhibited there were only the spikes preserved, and not the grasses themselves, so that it was impossible to judge of the value of the several species as producers of hay. The exhibition of English and Foreign hops appears to have much interested our visitors, who were struck with the fine specimens exhibited by Barth et fils, of Nuremberg, grown in Bohemia and Bavaria; and they regret that their own cultivators, from Burgundy especially, should have missed the opportunity of showing that their products were fully equal to those of Germany, and superior to most of the English exhibits. In the Côte d'Or the growth of hops is not sufficient for the consumption, though much progress is being made in recent years in their cultivation, especially since the loss of Alsace, formerly one of the principal hop-producing districts of France.

There is nothing very striking in the comments on the machinery, the attention of our visitors having been mainly directed to novelties; but they say "before leaving Kilburn we cannot help making this reflection—the exhibition which for so many days has presented to us this imposing spectacle, is the exclusive work of one private association. To prepare and to organise it the Royal Agricultural Society of England has not hesitated to spend more than a million francs. Will our Society of French Agriculturists, with all its energy and life, ever attain so much power as to try such bold experiments?"

After a brief retrospect of the farms which the writer had seen, he concludes:—

"Nothing is less like a French farm than an English one; the buildings here are conspicuous by their absence; one or perhaps two yards surrounded by very low sheds, inclosed on one side only, and that to the exterior with overlapping boards like the sheds of our railway stations, and on the other open to the yards. One side of the sheds furnishes shelter for the carts, and the many machines and implements which form the 'working stock' of the farm, the other sheds receive the animals during the rare intervals in which they leave the fields, and even then they are free to pass as they like from shed to yard and from yard to shed. The horse stable alone is enclosed, while in the yard the manure accumulates and rots. There are scarcely any barns, and the few which exist are continually being transformed into cattle-sheds. For the same reason cattle-sheds have no granaries over them, and are rarely more than (two metres) seven feet up to the eaves.

"One looks in vain for the great kitchen and the patriarchal table where the labourers of our farms seat themselves. None of these are fed by the farmer; every one of them, somewhere near the farm, has his own private house, to which an Englishman always clings, however small it may be. About these simple buildings are ranged a long belt of stacks, some of hay, some of corn. If the threshing has been finished and the straw consumed, the permanent steddles are ready for the future stacks. As necessary accompaniments to the stacks, rick-cloths are ranged with supporting poles to form, as it were, a temporary tent while the stacks are being built. By the side of the yards, and often communicating with them by a private entrance, is the farm-house, sometimes of a good size, but oftener uniting a modest with a neat and elegant appearance. Round the house, framed in verdure, is a garden full of charming flowers, almost always having a greenhouse, a verdant lawn, roads gravelled and inclosed with a neat fence, which the farmer, returning on horseback from his rounds amongst his meadows and his fields, opens with as much ease as any fox-hunter coming home to Leamington from the chase. This spectacle, which to eyes used to our French farms may appear a fancy sketch, is everywhere seen in England.

"So marked a difference from our own habits must rest on some higher cause, which there is no difficulty in discovering. The general idea of the establishment depends upon the system of cultivation, and this upon the climate. The foundation of English agriculture is the production of live stock; about three-fourths of the soil is devoted to its support, and only one-fourth to the plants which are directly used for the food of men. Pasturage is the foundation of all the farming; this is naturally the product of a climate essentially favourable to the growth of grass, almost always kept in a state of moisture by fog and frequent rain, never scorched up by a burning sun, and whose everlasting green, ever springing again during the grazing of the herds, makes the wealth of English agriculture and the reputation of her landscapes. Under this sky, nearly always overcast, is maintained a climate which escapes equally the excessive rigour of cold and the burning extreme of heat, and which animals are always able to sustain.

"From all that has gone before, we can see that it is more easy to point out the differences than to institute comparisons between French and English farms. A French farmer lives in his steading, an Englishman lives near it; the Frenchman boards and lodges most of his workpeople, the Englishman does not board or lodge any of them; the Frenchman tries to put everything under cover, both crops and stock, the Englishman likes to leave all outside and to have no more shelter than is absolutely necessary; the Frenchman would shut everything up, the Englishman would leave everything open. It would be impossible and even silly to suggest to our cultivators or proprietors to build farm buildings exactly like our neighbours, but what one can do in this study of the country buildings of our neighbours, is to look for certain practical notions which belong to every period, and certain details of execution in which they excel. Their first idea is a dislike of the magnificent and superfluous; the absolute avoidance of useless expenditure is nowhere more evident in England than in all that relates to these country buildings, which are considered unproductive capital whenever they exceed what is necessary. The farmer would no more think of asking for them than the landlord would think of building them; either of them would rather drain twenty acres than have a building which is of no use to any one.

"Another idea we can get from the English is the desirability, indeed the necessity, of plenty of ventilation for animals. Without going as far as they do, for our climate would not allow it, we might do much more in this way than we do. We should like particularly to point out the arrangements they adopt for all animals, even those which are being fattened, by the provision of a small court adjoining the building in which the animal is confined, which allows it at the same time a certain amount of exercise as well as the permanent shelter with which it must be supplied.

"But in spite of all these elements of prosperity, agriculture in England is suffering as well as in France. Although with a very natural national pride the English farmers concealed from foreigners their wounds under the brilliancy of their Exhibition, and kept silence under their suffering, yet English agriculture, even during our visit, raised a cry in the British Parliament which was heard by all the world. We felt for them a very great grief. It is the only painful impression we bring back from our journey."

I must say that I wish our French friends had seen more of us and at a happier time. Our cattle, at least in the north, do not lead quite such an exposed life as our visitors imagine. Those who know the value of covered yards and ample shed room for stock, will scarcely recognise the description of herds wandering forth at their own free will at all seasons, and even yet, although the custom is not so general as of old, the labourers and the hired servants of the house are fed by many farmers. Thanks, too, to our kind French friends for their sympathy in our year of difficulty. They have not been without their own agricultural troubles.

We would fain hope we may welcome some of them at Carlisle, with brighter suns and under happier auspices; and though we cannot hope to show them a Windsor, or a Woburn, or a Rothamsted, nor perhaps farm-houses standing in their flowery lawns, they will see how our north-country farmers have held their own against the hardships of their climate, and may visit a border land rich in the traditions of Scotch and English life, and I am sure they will meet with a hearty and appreciative welcome.

XI.—*Report of the Judges of Foreign Draught Horses at Kilburn*, 1879.*

These horses were entered in the Catalogue in several classes under the following names:—"Percheron and Boulonnais," "Flemish," and "other Foreign Draught Horses." The classes represented were Nos. 238 and 239, and 242 to 245; but in these six classes there were altogether only sixteen entries.

The abstention of foreign exhibitors is very much to be regretted, but its solution is to be found in the difficulty of conveying animals across the sea, and more especially in the measures of sanitary police which the English Government has felt bound to take with regard to foreign animals. It is true that these precautionary regulations do not apply to horses, but many breeders, frightened already by the inconveniences of the journey, have recoiled before the precautions which they believed were applicable to them, but which also they did not clearly understand.

Class 238.—*Percheron and Boulonnais Stallions.*—This class contained five entries, all of which were present; and of the six classes which we had to judge it was certainly the one which came before us under the best circumstances. All the horses in this class possessed the characteristic grey colour of the Percheron and Boulonnais breeds, to which they all belonged more or less. The first-prize stallion, "Turenne," No. 7692, belonging to M. Pierre Louis Modesse-Berquet, a French exhibitor, was foaled in 1871, in the department of the Pas-de-Calais. It is one of the best types of the French draught horse, being both strong and light. Its head is delicate, the stride long, body near the ground, and the limbs are big and well set on. This horse trots with perfect ease. It carried off the first prize at the Universal Exhibition at Paris for draught stallions under 16 hands high. The second prize, "Brilliant," No. 2688, belonging to His Grace the Duke of Westminster, is also of French extraction; it possesses those qualities which are appreciated in a draught stallion, while at the same time it trots easily. The third-prize stallion, "Prince," No. 2691, belonging to M. Modesse-Berquet, is 7 years old. It has the true stamp of the Boulonnais breed, much more pronounced than No. 2692. It is more massive, and has lightness in its movements. We will only mention the two remaining horses in this class, "Hercules," No. 2690, and "Sultan," No. 2689, as they showed nothing particular that requires description.

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* This Report was received too late to be included in the "Report on the Horses at Kilburn," published in the last number of the 'Journal,' pp. 565-601. - Editor.

Class 239.—*Percheron and Boulonnais Mares, with or without Foals.*—There were only two mares in this class, and they appeared to be of French origin. They were wanting in any distinctive features, but they appeared to have most affinity with the Boulonnais breed. Slender in their limbs, they were heavy and wanting in action. Both belonged to Mr. W. P. Warner, of the Welsh Harp, Hendon, and the first prize was awarded to "Milly," No. 2694, the second going to "Nora," No. 2698.

Class 242.—*Flemish Stallions.*—Only one entry was made in this class, namely, a Flemish stallion called "Brilliant," No. 2717, belonging to M. Remi Vandeschuere. This is a chestnut horse, 8 years old, about 16·1 in height, and one of the best types of the Flemish breed. It obtained the first prize at the Paris Exhibition in 1868 for draught stallions of 16 hands and upwards.

Class 243.—*Flemish Mares, with or without Foal.*—There was only one Flemish mare in this class, exhibited by M. Paul Tiberghien, of Senesse, Belgium. This was a bay-brown, called "Altesse," No. 2720, 6 years old, in foal to "Duke of Waterloo." This animal was so deficient in the points that a brood mare should possess, that the Judges awarded it only the third prize.

Class 244.—*Stallions of other Foreign Draught Breeds.*—This class contained only three Belgian horses, which certainly were not some of the best representatives of their country. The Judges placed them in the following order:—First prize went to "Bayard 3rd," No. 2723, a three-year-old roan, well got up, and tolerably regular in form, but wanting in action. The second-prize horse was "Neron," No. 2721, a three-year old bay, belonging to M. E. Lambert, of Braisne-le-Comte, Belgium. This was a massive horse, having little merit. The third prize was awarded to the "Duke of Waterloo," No. 2722, a four-year-old chestnut, of ordinary character, belonging to M. Paul Tiberghien.

Class 245.—*Mares of other Foreign Draught Breeds, with or without Foals.*—This class contained five mares, all belonging to M. Paul Tiberghien. Of these, one was nine years old, two were five, and the remaining two were three years old. The oldest of these, "Sultana," No. 2784, was the best, and the only one of a grey colour, the others being roan. "Sultana" is a very fine mare, with plenty of blood, and a remarkable trotter. She reminds one much of the old mares called "Mareyeuse," which were formerly found in the Boulonnais, and received that name because they were specially employed in carrying fish from the sea-coast to Paris. This type of horse is very rare now-a-days. "Sultana" obtained a first prize at the Paris Exhibition, 1878. The four remaining mares—the best one of which was ill—presented nothing characteristic.

The exhibition of Foreign Draught Horses was thus of little importance. We regret this the more because the Continent should have been able to send a collection worth serious study as agricultural horses by the Royal Agricultural Society of England. The English exhibition was very complete and well selected; and it would have been exceedingly interesting to compare with it the different breeds of horses of the countries which had been invited to take part in this magnificent Show. The Society included in this category the Percherons and Boulonnais, the Normans and Anglo-Normans, the Flemish, and finally horses of other foreign breeds, whether for draught or for riding purposes. This classification leaves something to be desired, because it gives the exhibitors the choice of entering their horses in those classes in which they think they are most likely to obtain prizes. At the present time, the various breeds have disappeared, and it is very difficult to distinguish them amongst all these animals bred from all kinds of stallions. We believe that a classification of horses according to their use or capacity would be more practical for agricultural horses, specifying their divisions according to age and weight. It would thus have been possible to establish a class of draught horses which could work at a walking pace and another which could work at a trot, without taking into account the origin of the animals —a regulation which leads to grave errors, as at present Percherons are bred in the Boulonnais and *vice versâ*.

We regret also that the Royal Agricultural Society has not brought together in competition English and foreign horses without any other distinction than those of use, age, and height. We believe that under these conditions the aim of the competition would be better attained, and its study would be more interesting.*

In conclusion, we ought to say that amongst the sixteen draught horses exhibited, three are remarkable animals. These are—"Turenne," No. 2692, a stallion of the best type of the French Percheron breed; "Brilliant," No. 2717, a stallion of a good type of the Flemish breed of heavy draught horses; and "Sultana," No. 2724, old as she is, a most exact and most rare representative of the small Boulonnais breed called Mareyeuse. Certainly these three animals are excellent types of the breeds which they represent; but we still think that the Continent possesses animals even more remarkable, and we regret that we did not see them exhibited at this magnificent Show.

Signed LAVALARD.
H. VAN WICKEVOORT CROMMELIN.

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* This Report appears without the signature of the English Judge—Colonel Barlow—chiefly because he dissents from the opinions expressed in this and the preceding paragraph.—EDITOR.

XII.—*Our Climate and our Wheat-Crops.* By J. B. LAWES, LL.D., F.R.S., F.C.S., and J. H. GILBERT, Ph.D., F.R.S., F.C.S.

INTRODUCTION.
I. SEASONS OF HIGH AND OF LOW PRODUCTIVENESS (p. 175).
II. THE SEASON OF 1878–9, AND THE EXPERIMENTAL WHEAT-CROPS AT ROTHAMSTED (p. 195).

INTRODUCTION.

SINCE the publication of our Paper, "On the Home Produce Imports, and Consumption of Wheat," in this 'Journal' in 1868 (vol. vi. s.s., part 2), more than eleven years have passed away, —years during which the agricultural interests of these islands have experienced a transition from a state of great prosperity to one of great depression,—years during which the worst features of our climate have been exhibited in unusual frequency, and which have terminated with a season, not only by far the worst for the wheat-crop since the commencement of our experiments on the continuous growth of the crop in 1843–4, but probably the very worst that has occurred since observers have furnished us with records of temperature and rainfall, and with other weather statistics.

It has been remarked that, so far as climate is concerned, the British Isles are outside the zone favourable to the growth of wheat, and that its successful cultivation is due to the skill of the farmer in contending against adverse meteorological conditions. It is true that the area under the crop is rapidly diminishing, and that its continued growth appears to gravitate to those districts where the climate, or the soil, or the combination of the two, is the most favourable. But the great decline in area cannot be attributed to any general change for the worse in the characters of the climate. Indeed, Mr. Glaisher has recently called attention to the fact that, dividing the last 108 years into six periods of eighteen years each, there is even a slight progressive increase of mean temperature from the first to the last of those six periods. It is to the greatly increased production of wheat in other countries, at a lower cost than in our own, and to low rates of transport, by which it is brought into our markets in quantity and at a price much reducing the value of the home-produce, that the reduced area under the crop is chiefly to be attributed.

As only about 5 per cent. of the total wheat-crop is derived from the soil itself, the remainder coming, directly or indirectly, from the atmosphere; and as the amount of matter accumulated from either source depends mainly on the quantity, and the relations to one another, of heat and moisture, we cannot be surprised that the character of the seasons exercises such a preponderating influence over the growth of our crops. As yet, however, the connection between meteorological phenomena and the progress of vegetation is not so clearly comprehended as to enable us to estimate with any accuracy the yield of a crop by studying the statistics of the weather during the period of its growth. Experience does, indeed, teach us that we may expect better crops under certain conditions of the weather than under others. But it is only by a careful comparison of the characters of the seasons on the one hand, and of the quantity and quality of the produce on the other, for many years, that we can hope to acquire sufficient knowledge to enable us to assign to the various agencies, the sum of which constitutes the climate of the year, their respective values in the production of the crop. As we have said before (this 'Journal,' vol. ix., part 1, p. 96):—"Thus, it is obvious that different seasons will differ almost infinitely at each succeeding period of their advance, and that, with each variation, the character of development of the plant will also vary, tending to luxuriance, or to maturation, that is, to quantity, or to quality, as the case may be. Hence, only a very detailed consideration of climatic statistics, taken together with careful periodic observations in the field, can afford a really clear perception of the connection between the ever-fluctuating characters of season and the equally fluctuating characters of growth and produce. It is, in fact, the distribution of the various elements making up the season, their mutual adaptations, and their adaptation to the stage of growth of the plant, which throughout influence the tendency to produce quantity or quality. It not unfrequently happens, too, that some passing conditions, not indicated by a summary of the meteorological registry, may affect the crop very strikingly; and thus the cause will be overlooked, unless careful observations be also made, and the stage of progress, and tendencies of growth, of the crop itself at the time, be likewise taken into account."

Still, such records as we do possess, of the conditions as to temperature and moisture of different seasons, are sufficient to account in great measure for the great variation in the quantity and the quality of our crops. The actual amount of rainfall must, however, be carefully considered in connection with the temperature of the period. For example, it is obvious that a given amount of rain, equally distributed through the spring and summer in each of two seasons, will have a very widely different effect on vegetation in the two cases, if the one season should be at the same time a hot and the other a cold one. Or, if the temperature of the two seasons be the same, but the rainfall very different, so also will the effect on vegetation be very different. It is generally supposed that the temperature of our summers is not, on the average, sufficiently high for the production of abundant and well-ripened crops of wheat; and that it is in the hottest seasons that the produce is the most abundant. This may be the case so far as a certain class of soils is concerned. But a good deal of wheat is grown upon light land, on which the crop suffers considerably in a season of drought or unusual heat. It would appear that the defect of our climate for the production of wheat is more connected with an excess of moisture than with a deficiency of heat, during the periods of active growth and maturing. It is, in fact, when a cold season, or one of only moderate temperature, is acompanied by an excess of rain, that we find the yield of our wheat-crops is the most defective.

I. SEASONS OF HIGH AND OF LOW PRODUCTIVENESS.

Before entering upon any detailed consideration of the peculiarities of the season and of the experimental wheat-crops at Rothamsted, in 1879, we will endeavour to illustrate, in broad outline, the general characters of season under which some of the best and some of the worst wheat-crops of which we have the record, or the experience, have been grown in this country. For this purpose we will disregard any special characters of the seasons in question at Rothamsted, and draw our illustrations entirely from independent data; namely, the records of the observations of temperature and rainfall made at the Royal Observatory at Greenwich; and we adopt for the most part those published by Mr. Glaisher. It is obvious that even such data are more or less local in their application; still, they do indicate the general character of the different seasons, and their distinction from one another.

In Tables I. II. and III., which follow, are given the particulars of the temperature and rainfall of fourteen seasons during the present century, each of which was more or less remarkable so far as the growth of the wheat-crop is concerned. These are 1816, 1832, 1833, 1834, 1835, 1853, 1854, 1857, 1860, 1863, 1864, 1868, 1870, and 1879. The first and the last of them, 1816 and 1879, have the character of yielding the two worst wheat-crops within the period included by those dates, if not indeed within the century. Some of the others were, also, seasons of great deficiency; but others, though, as will presently

TABLE I.—TEMPERATURE of SELECTED SEASONS, of HIGH and of LOW PRODUCE of WHEAT.

MONTHS.	Season 1815–16.	Season 1831–2.	Season 1832–3.	Season 1833–4.	Season 1834–5.	Season 1852–3.	Season 1853–4.	Season 1856–7.	Season 1859–60.	Season 1862–3.	Season 1863–4.	Season 1867–8.	Season 1869–70.	Season 1878–9.	Average 108 Years, 1771–1878.
MONTHLY MEAN TEMPERATURE AT GREENWICH.*															
	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°
October ..	50·1	55·0	51·2	48·3	50·5	47·9	50·9	51·7	50·9	51·8	51·6	48·7	48·9	51·5	49·6
November ..	38·0	44·3	43·7	43·5	44·1	48·9	42·1	40·7	42·1	39·8	45·7	41·4	43·0	39·7	42·3
December ..	36·6	42·0	42·4	44·6	41·0	47·6	34·0	40·2	36·8	43·6	43·2	37·5	37·9	33·7	39·2
January ..	36·3	37·3	34·5	44·4	38·0	42·4	39·0	36·6	39·7	41·8	36·5	37·2	38·3	31·9	36·6
February ..	34·5	36·9	42·4	40·2	41·2	33·3	39·5	39·2	35·7	42·1	36·0	43·0	36·2	38·2	38·7
March ..	39·4	40·5	37·6	44·0	41·0	38·5	43·8	41·8	41·1	43·9	41·3	44·0	39·6	41·2	41·1
April	43·6	47·2	45·2	45·0	46·4	45·2	48·4	45·7	42·9	49·1	48·2	48·1	48·9	43·2	46·1
May	49·3	51·5	59·4	56·9	52·9	52·0	50·9	54·0	53·8	52·0	53·8	57·3	53·4	48·4	52·5
June	55·1	59·2	59·8	61·1	60·0	58·2	55·7	61·8	54·8	58·1	57·4	62·0	60·9	56·9	58·2
July	57·0	61·2	61·1	64·1	64·4	60·3	60·3	64·5	57·9	60·8	61·8	67·5	65·4	58·1	61·6
August ..	56·3	61·0	57·5	62·3	63·3	60·0	60·9	65·8	57·7	61·9	59·6	63·6	61·1	59·9	60·9
September	54·1	56·6	53·5	58·3	57·1	55·3	58·1	59·7	53·4	53·7	56·9	60·5	55·7	56·3	56·5
Average	45·9	49·4	49·0	51·1	50·0	49·1	48·6	50·1	47·2	49·8	49·3	50·9	49·1	46·6	48·6

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* All from Mr. Glaisher's table, Phil. Trans. Part II. 1850, and from a manuscript table kindly supplied by him for the later years; excepting for 1815–16, for which we have calculated the average for each month from Mr. Glaisher's record of the daily temperatures (Report of the Council of the Brit. Met. Soc. May, 1857), as the values so obtained accord better with other records.

Table II.—Rainfall of Selected Seasons, of High and of Low Produce of Wheat.

Months.	Season 1815–16.	Season 1831–2.	Season 1832–3.	Season 1833–4.	Season 1834–5.	Season 1852–3.	Season 1853–4.	Season 1856–7.	Season 1859–60.	Season 1862–3.	Season 1863–4.	Season 1867–8.	Season 1869–70.	Season 1878–9.	Average 63 Years, 1815–1877.
	Monthly Rainfall at Greenwich.*														
	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
October ..	2·63	5·50	2·53	1·32	0·44	3·75	4·23	1·91	3·60	4·07	1·82	2·14	1·77	1·66	2·8
November ..	1·51	2·10	1·65	2·31	1·32	6·00	1·95	1·25	2·90	1·00	1·59	0·42	2·38	3·45	2·4
December ..	2·26	2·10	1·10	4·84	1·10	2·20	0·80	1·83	2·17	1·59	1·08	1·97	2·77	1·16	2·1
January ..	2·09	1·21	1·10	3·08	0·66	2·11	1·40	2·60	1·81	2·71	0·88	4·19	1·49	2·59	2·0
February ..	1·62	1·60	3·63	0·44	2·64	1·48	1·21	0·20	1·10	0·50	0·76	1·28	0·54	3·82	1·5
March ..	1·88	1·43	0·99	0·66	2·53	1·50	0·32	0·83	1·86	0·70	2·53	1·07	2·05	0·60	1·6
April	2·13	0·44	1·21	0·55	1·10	3·21	0·59	1·40	1·00	0·45	0·82	2·08	0·28	2·60	1·7
May	2·15	1·54	0·22	0·99	3·08	1·50	3·51	0·33	3·90	1·25	2·00	1·67	0·47	3·36	2·0
June	2·41	3·30	2·09	1·54	2·42	2·75	0·91	2·70	5·80	3·91	0·92	0·47	0·39	4·29	1·9
July	4·30	0·66	1·65	5·28	0·33	5·48	1·75	1·10	2·80	0·88	0·27	1·06	2·01	3·72	2·6
August ..	2·53	3·41	1·76	3·30	1·10	2·75	2·61	2·50	3·68	1·82	1·31	2·61	2·02	5·19	2·4
September	2·05	0·44	1·87	0·88	4·18	2·23	0·98	3·40	3·10	2·95	2·76	1·52	1·63	2·87	2·4
Total ..	27·56	23·73	19·80	25·19	20·90	34·96	20·26	20·05	33·72	21·83	16·74	20·48	17·80	35·31	25·4

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* For 1815-16 we adopt data kindly supplied by Mr. George Dines. For 1831-2, 1832-3, 1833-4, and 1834-5, we take the figures given by Mr. James Simpson, Jun. ('Metropolitan Drainage Reports,' 1857, Appendix III.), which also correspond with those adopted by Mr. Dines and others. For 1852-3, 1853-4, 1856-7, 1859-60, and 1862-3, results kindly provided by Mr. William Ellis; and for 1863-4, 1867-8, and 1869-70, Mr. Glaisher's records ('Proceedings and Quarterly Journals of the Meteorological Society') are adopted. For 1878-9, the Registrar-General's weekly returns are taken

TABLE III.—RAINFALL of SELECTED SEASONS, of HIGH and of LOW PRODUCE of WHEAT.

MONTHS.	Season 1815–16.	Season 1831–2.	Season 1832–3.	Season 1833–4.	Season 1834–5.	Season 1852–3.	Season 1853–4.	Season 1856–7.	Season 1859–60.	Season 1862–3.	Season 1863–4.	Season 1867–8.	Season 1869–70.	Season 1878–9.	Average 55 Years, 1815–1869.
NUMBER OF DAYS ON WHICH 0·01 INCH OR MORE FELL, AT GREENWICH.*															
	Days.	Days.	Days.	Days.	Days.	Days.	Days.	Days.	Days.	Days.	Days.	Days.	Days.	Days.	Days.
October ..	14	19	16	13	9	15	27	10	23	16	17	21	11	13	14
November ..	11	15	15	10	10	22	11	10	20	8	11	5	11	15	13
December ..	20	19	16	27	7	19	12	13	20	16	8	12	13	16	12
January ..	16	10	9	26	8	20	15	19	22	16	11	21	15	12	12
February ..	9	7	21	11	16	13	8	3	17	9	12	11	12	21	11
March ..	13	14	12	7	19	14	6	10	22	10	15	16	11	14	12
April	14	7	21	7	10	16	7	18	15	9	4	10	6	16	11
May	15	13	3	7	14	12	16	5	16	10	10	6	5	15	11
June	13	13	14	9	7	17	12	9	24	14	10	5	4	20	11
July	24	5	9	13	6	17	15	9	11	3	3	6	10	19	11
August ..	18	17	7	10	4	10	12	11	23	13	5	12	10	20	11
September ..	14	6	14	9	19	15	9	13	17	14	16	9	8	14	12
Total ..	181	145	157	149	129	190	150	130	230	138	122	134	116	195	141

* According to Mr. Glaisher's records ('Proceedings and Quarterly Journals of the Meteorological Society'), and for 1878–9, the Registrar-General's weekly returns.

be seen, they were in some points essentially different from one another, were nevertheless characterised by yielding very abundant crops, of very good quality; some of them, it is supposed, the most abundant within the period under review. By the side of the particulars of temperature and rainfall of each of those fourteen seasons there are given the mean temperature of 108 years, the average rainfall of 63 years, and the average number of days of rain of 55 years. It will be observed that each "season" is here reckoned to include the last three months of the year preceding that of the crop, as the characters of the autumn and early winter may materially affect the getting in of the seed and the early progress of the plant.

We will first call attention to the characters of four consecutive seasons of reputed very high productiveness, which occurred before the commencement of the Rothamsted experiments, and of which we have only such knowledge as is on record respecting them. These are 1832, 1833, 1834, and 1835. Among this series 1834 was by far the most abundant; and it is generally referred to as one of the most productive of the century. So abundant were these four wheat-crops, that the average price, even under protection, went down from 54*s.* 5*d.* per quarter over the first harvest-year, to 49*s.* 9*d.* over the second, 41*s.* 5*d.* over the third, and 42*s.* 8*d.* over the fourth. The lowest price reached was 36*s.* per quarter in the last week of 1835 and the first of 1836. And such was the distress suffered by the agricultural interest, as the result of abundant wheat-crops, and the low prices following, that Select Committees of the House of Lords, and of the House of Commons, respectively, were appointed to inquire into the matter; as now we have a Royal Commission to inquire into the distress caused, not by abundant, but by deficient crops, and large importations, though by no means such low prices as during the period of great abundance.

1832.—The records show considerably higher than average temperatures during October, November, December (1831), and January (1832); a great excess of rain in October, and about average amounts in November and December, but a deficiency in January. February and March were rather under average as to temperature, with fairly average amounts of rain. In April the temperature was rather over, in May rather under, in June rather over, in July rather under, and in August about average. There was a considerable deficiency of rain in April, May, and July, and again in September, but a considerable excess in June and August. Of this season, Tooke and Newmarch say that the winter was open, the spring of medium forwardness, the summer unsettled to the end of July, then fine to the end of August, when heavy rains damaged the crops still out. Of the crops they say they were well harvested south of Yorkshire, and that the yield was abundant.

Thus this abundant crop was grown under the influence of a mild and rather wet winter, a spring of moderate characters, and a summer of only moderate temperatures, and with heavy rains excepting in July.

1833.—October, November, December, and February were for the most part considerably warmer than the average; but January and March were considerably colder, and April rather colder than the average. There had been a considerable amount of rain in October, and there was a great excess in February; but there was a deficiency in every other month from November to May inclusive. May was also unusually hot; June was hot with a rather high total of rain, but greatly due to a violent gale about the middle of the month; July was rather, and August and September were considerably, below the average as to mean temperature; but the fall of rain during the three months was below average. Tooke and Newmarch say that the winter was open and wet, the spring wet excepting part of March; May, and most of June, fine; July showery, and the autumn mostly favourable for maturing and harvesting the crops, which were rather thin on the ground, but yielded well.

Thus this second of the series of abundant wheat-crops was grown in a season characterised by a generally mild and moderately wet winter and early spring, excepting January and March, which were cold. The remainder of the spring, and the early summer, were hot and mostly dry, and the rest of the season upon the whole favourable. The result was a high yielding, but not bulky straw crop.

1834.—The mean temperature was higher than the average in every month from November 1833 to September 1834 inclusive, excepting in April, when the deficiency was not great. The excess was the most marked in the winter and in May, June, and July. November, December, and January were wet as well as warm; but February, March, April, and May were very dry, and June was scarcely average as to rainfall; in July there is a great excess indicated, which, however, was due to a tremendous storm, chiefly confined to London and twenty or thirty miles distant; in August there was again an excess, but in September a considerable deficiency. According to Tooke and Newmarch, the winter was mild and wet, the spring generally forward, the summer decidedly fine and dry, with high temperatures, and the autumn also fine; the wheat-crop remarkably abundant, got in well, of fine quality, and large yield.

This which was one of the heaviest crops of wheat on record was, therefore, grown in a season warmer than usual almost throughout, but especially in the winter and in the spring, excepting April; and, after an excess of rain in the winter, there was a considerable deficiency for four months, to the end of May,again a deficiency in June, but afterwards heavy rains, though with high temperatures.

1835.—The mean temperatures were higher than the average in every month from November to September inclusive, excepting in March, which was close upon the average. There was a considerable excess of rain in February, March, May, and June, but a considerable deficiency in October, November, December, January, April, July, and August. Tooke and Newmarch observe that the winter was as open, and as much marked by an absence of snow and frost as the three preceding winters; that the spring was upon the whole favourable to the wheat-crops; the summer brilliantly fine till the last week in June, and the wheat of extraordinary bulk and luxuriance. At the close of June heavy rains and high winds laid the crops; but bright breezy weather in July stayed the damage, though much did not ripen well. The rest of the season was fine. The wheat-crops were got in in excellent order; but, though bulky, they were decidedly inferior in both yield and quality to those of 1834.

To sum up in regard to these four consecutive seasons of abundant wheat-crops: it is seen that they were characterised by mild and open winters, upon the whole mild springs, and average or warmer than average summers—especially the last two of the four. In each season there were individual months of considerably more than average fall of rain, sometimes earlier, and sometimes later, and accordingly influencing the bulk of the crop. But each season was characterised by less than the average fall of rain during several months of the growing period, and this was particularly the case in the season of 1834, the one of the most extraordinary productiveness.

We now come to those of the seasons selected for illustration which have occurred since the commencement of the Rothamsted experiments, and the characters of which are, therefore, more within our own knowledge and observation. Of these we will take first the seasons of high productiveness, and take them in chronological order.

1854.—November (1853) was about, but December considerably below, the average as to temperature, indeed very severe; and portions of January and February were also severe, with heavy snow in January; but still the four months, January to April inclusive, each showed higher than the average mean temperature. In October (1853) there had been a great excess of rain, but during each of the six months from seed-time to the end of

April there was a considerable deficiency, and in all only half the average fall, the total deficiency for the six months amounting to about 5½ inches. In May there was a considerable excess of rain, which was very beneficial to the crops after the long dry period. There was again a considerable deficiency in June and July, but an excess in August. As to temperature, May, June, and July were all below the average; and August only average. Of this season Tooke and Newmarch say—that May was cold and wet, June cold and ungenial, with less sun than usual, July not one day of summer-heat; harvest ten days or a fortnight later than usual. And of the crop they say—the largest yield per acre that has been known for years, the largest since 1834. Our own estimate of the crop over the United Kingdom was 35⅞ bushels, reckoned at 61 lbs. per bushel, the average of sixteen years being 28¼ bushels.

Thus, the crop of 1854, which was very abundant both in corn and straw, was, after a severe winter period, grown under higher than average temperatures during the earlier, but lower during the later, periods of growth; and with much less than the average fall of rain in every month from seed-time to harvest, excepting in May and August.

1857.—This was a season of much more than average productiveness of corn, but of only about average growth of straw, and it was characterised as follows:—The mean temperature of each of the six months, from November to April inclusive, varied little from the average; but May was 1·5, June 3·6, July 2·9, and August 4·9 degrees warmer than the average. There had been much less than the average fall of rain in October 1856, and in each of the seven months from November to May inclusive there was a considerable deficiency of rain, excepting in January, when there was an excess. The total deficiency during the seven months from seed-time to the end of May was about 5¼ inches. In June there was rather more than average, in July much less, but in August some excess.

Thus, this heavy corn- but not heavy straw-crop was obtained under the influence of about average winter and early spring, but high summer temperatures; and, as in other cases of high productiveness, there was here again much less than the average fall of rain from seed-time to harvest, the only months of any excess being January, June, and August.

1863.—The harvest of 1863, not only yielded in our own experimental wheat-field the most abundant crop since the commencement of the experiments in 1843–4, but it probably gave the highest average produce per acre over the country at large since 1834. With the exception of November (1862), which was unusually cold, every month from seed-time to the end of April was warmer than the average. The excess was in December 4·4, in

January 5·2, in February 3·4, in March 2·8, and in April 3 degrees. In October (1862) there had been a considerable excess of rain; but from that time to the end of May there was a considerable deficiency in every month excepting January, when there was an excess. The total deficiency in the seven months from November to May inclusive was more than 5 inches compared with the average. Thus, after an excess of rain in October, the winter and spring were not only unusually warm, but unusually dry, bringing the plant very early forward. May showed, however, rather lower, and June, July, and August only about, or but little higher than average temperatures. In June there was a considerable excess of rain, which, coming after such a long dry period, much aided growth, though it was sometimes so heavy as to lay the most forward and bulky crops. July and August were, on the other hand, considerably deficient in rain.

To sum up:—The conditions of season which gave the most abundant produce of both grain and straw throughout the thirty-six years of our experiments, and also much higher than average weight per bushel of grain, was characterised by an extremely mild winter and early spring, with much less than the average fall of rain during that period. The plant was thus brought early forward. Then came, in the early summer, a considerable amount of rain, after which there was a deficiency up to harvest. The temperature was only about the average in June and July, conducing to continued luxuriance rather than to early maturation; whilst August, the harvest month, was both warmer and drier than usual. The conditions were, therefore, those of a lengthened and almost unbroken course of gradual accumulation, with finally a favourable ripening period.

1864.—As has been seen, the crop of 1863 was probably the most abundant, both in corn and straw, of any among the thirty-six years of our observations—indeed the most abundant since 1834; and that of 1864, immediately succeeding it, is estimated to be only second to it in bulk and yield. October 1863 had been both warmer and drier than usual. Five out of the seven months, from November to May (1864) inclusive, were warmer than the average. The exceptions were January, which was only average, and February, which was 2·7 below average. With these prevailing higher than average temperatures during the winter and spring, there were nearly 4 inches less than the average fall of rain from seed-time to the end of May. The only month in which there was an excess was March, whilst in May there was only the average fall. June was rather below, July but little above, and August again rather below the average as to temperature; whilst in each of these three months there was much less than the average fall of rain.

Here again, then, the very large crop was produced under the influence of warmer than average weather in early winter and in spring; only moderate or even lower than average summer temperatures; but much less than the average fall of rain from seed-time to harvest; every month being considerably deficient, excepting May, which was average, and March, in which alone there was an excess.

1868.—After a favourable seed-time, the early winter of 1867–8 was very variable as to temperature, including some warm, but more stormy, wet, snowy, and frosty weather. From February, inclusive, to after harvest, the temperature was almost always above the average, and greatly so in May, June, and July; whilst, after a considerable excess of rain in January, there was, in each month from February to July inclusive, excepting in April, an unusual deficiency.

The period of growth was, therefore, almost throughout one of drought, with high temperatures throughout both spring and summer. The result was a very early harvest, a not bulky, but a high-yielding crop on good and well-farmed soils, but a deficient one on light and poorly-farmed land.

1870.—The autumn of 1869, though frequently cold, boisterous, and inclement, was upon the whole not unfavourable for getting in the seed. The winter and early spring were changeable, and upon the whole colder than the average. But from the beginning of April until harvest the weather was, with few exceptions of short duration, warmer than usual, with a great deficiency of rain. The combined heat and drought were even more extreme during the months of May, June, and July, 1868, than during the corresponding months in 1870; the mean temperature being notably higher in each of these months in 1868. But in 1870 the deficiency of rain commenced a month earlier, and was greater than in 1868.

After a by no means favourable winter, followed by prolonged spring and summer drought and heat, the wheat-crop of 1870 was deficient in straw, and also yielded less corn than that of 1868, but still considerably more than the average, a high proportion of corn to straw, and high quality of grain.

Thus, out of the six years of highest productiveness throughout the thirty-six seasons of our experiments, the three which gave the highest produce of all, and high produce of straw as well as corn, and also high quality of grain (1863, 1864, and 1854), were characterised by generally higher than average mean temperatures during the winter and early spring (excepting the early winter of 1853–4, which was severe), but generally only average, or lower than average, summer temperatures. Indeed, June 1854 was colder than June 1879. Each was also characterised by very much less than the average fall of rain from seed-time to harvest; there being in no case an excess in more than two out of the nine months from November to July inclusive. The other three seasons of high productiveness, 1857, 1868, and 1870, though they gave less corn than the foregoing, and very much less straw, were, nevertheless, seasons of considerably more than average produce of corn, and of high quality of grain. These less bulky, but high-yielding crops were grown under more variable winter conditions as to temperature, but under much higher both spring and summer temperatures, especially those of 1868 and 1870; whilst, with the higher temperature there was, as in the cases with lower temperature and more abundant crops, much less than the average fall of rain from seed-time to harvest, one or two months only showing an excess.

We now come to the consideration of the seasons selected for illustrating the characters of low productiveness, namely, 1816, 1853, 1860, and 1879. We will first refer to the last three, which come within the period of our own observations, and then compare the characters of the extraordinarily unproductive season of 1879 with those of the also extraordinarily unproductive one of 1816.

1853.—The winter was very unseasonably warm and also wet. There had been a great excess of rain in October and November, and fully average amounts in December and January, causing floods, and much land intended for wheat remained unsown. From February to September, inclusive, every month was colder than the average, excepting May and June, which were about average; and the deficiency was greater in the spring than in the summer. In April there was a great excess of rain; in May there were heavy snow-falls; in June there was an excess of rain; in July a very great, and in August some, excess; and in September about an average amount. The breadth of land under wheat was much reduced, and the crop was reported to be far inferior, both in quantity per acre and in quality, to that of any season for many years past.

Thus the conditions under which this very inferior crop was grown were—that the early winter had been unseasonably wet and warm, the land being generally saturated with water, and in many cases flooded; the spring was unseasonably cold, and also wet; and the summer was also upon the whole colder than the average, and very wet.

1860.—From November (which was about average as to temperature) to May, inclusive, the months were alternately much colder and warmer than the average, May being warmer. But June, July, August, and September were all unusually cold and sunless for the period; very much more so than in 1853. There had been an excess of rain in October and November, but from that time till the end of April only moderate amounts, with, however, snow in February, March, and April. There was a great excess of rain in May, June, August, and September, and there was about an average amount in July. The harvest was very late. Wheat was in some localities not deficient in bulk, but generally very much damaged, yielding but a small proportion of grain, and that of very low quality.

The characteristics of this season, yielding a crop both late and much below the average, both in quantity and quality, were, then, a winter alternately very cold and very mild, and upon the whole wet, followed by a spring, summer, and autumn generally stormy, cold, wet, sunless, and unseasonable.

1879.—Of all the eleven months, from November to September inclusive, March alone showed about average mean temperature. Each of the others was colder than the average. The deficiency was in November 2·6, in December 5·5, in January 4·7, in February 0·5, in April 2·9, in May 4·1, in June 1·3, in July 3·5, in August 1, and in September 0·2 degree. Then as to the rainfall. There was an excess in every month of the eleven excepting December and March. In November the excess amounted to 1·05, in January to 0·59, in February to 2·32, in April to 0·90, in May to 1·36, in June to 2·39, in July to 1·12, in August to nearly 3 inches, and in September to 0·43 inch. The total excess over the period was more than 11 inches.

Thus, from seed-time to the harvest of 1879, there was a considerable deficiency of temperature, compared with the average, in every month excepting March. It is remarkable, however, that there was even a lower mean temperature in June 1854, a season of very great abundance, than in June 1879, the season of the worst crop known within the century. But it was by the continuity and excessive amount of the rainfall that the season of 1878–9 was especially characterised; the excess during the eleven months from November to September inclusive, being, as already said, more than 11 inches over the average; and the total amount was more than double that over the same period of some of the seasons of high productiveness.

It remains to compare the characters of the disastrous season of 1878–9, with those of 1815–16, to which period, by common consent, we must go back for a wheat-crop at all approaching in deficiency, both in quantity and quality, that of the season just past.

1816.—Each of the ten months from November 1815 to August 1816, inclusive, was colder than the average. The deficiency was—in November 4·3, in December 2·6, in January 0·3, in February 4·2, in March 1·7, in April 2·5, in May 3·2, in June 3·1, in July 4·6, and in August 4·6 degrees. The average deficiency over the ten months was 3·1 degrees; and the deficiency was the greatest in the months of more active growth and of maturation. Compared with 1878–9, December and

January (1815–16) were not nearly so cold, but November, February, and March were colder in 1815–16. The mean temperatures of April and May were rather the higher in 1816; but those of June, July, and August were considerably lower in 1816 than in 1879. In fact, there is no instance of so low a temperature prevailing throughout these three summer months, in any other of the 108 years, the temperature for which Mr. Glashier has given us the record. In each of the seven months, November 1815 to May 1816 inclusive, the fall of rain was only about, or not much over, the average; there being only one-third of an inch of excess compared with the average over that period; whilst, during the same months of 1878–9, there was an excess of more than 4¼ inches, and an excess compared with 1815–16 of nearly 4 inches. In June 1816 there was an excess, in July a great excess, but in August only a slight excess of rain; the total excess in the three summer months being only 2·34 inches, whilst in 1879 it was 6·3 inches. Over the whole ten months from November to August inclusive, 1815–16 showed only a total of 2·68 inches, whilst the same period of 1878–9 showed an excess of 10·6 inches over the average of 63 years; and for the first nine months of 1879 a higher rainfall is recorded than in the corresponding period of any year of the sixty-three. In September 1879 there was considerably more rain than in September 1816. But afterwards, with a very late harvest in both cases, there was a considerable excess in 1816, and a considerable deficiency in 1879; and it is stated that, in 1816, some wheat was still out when the winter snows began.

Thus, from seed-time to the end of May, the season of 1815–16, though materially colder than the average, did not include such a severe period as that of the winter of 1878–9; whilst the fall of rain was very little over average, and very much below that of 1878–9. From seed-time up to the end of the spring, therefore, the season of 1815–16 was more favourable than that of 1878–9 as to temperature, and much more favourable as to rainfall—indeed, not specially unfavourable. During the three summer months, however, the temperature of 1816 was extremely low, and much lower than the corresponding though still low period of 1879. And, with the very low temperature of the summer of 1816, there was at the same time an excess of rain, but by no means so great an excess as in 1879; but subsequently, there was not only low temperature, but excess of rain in 1816, much damaging, and often preventing the harvesting of the crop.

There can be little doubt, therefore, that the season of 1879 was, from seed-time to the end of the summer, worse than that of 1816. The latter suffered more from low temperature, but less from excess of rain during the summer. Both crops were, however, very late, and, for getting in the crop, the season of 1816 was much worse than that of 1879.

Having now pointed out the prominent characters as to temperature and rainfall of each of the fourteen seasons selected for illustration separately, it will be of interest, disregarding as much as possible the specialities of individual seasons, to consider the average character of classes of seasons, arranged according to the general character of their wheat crops. Accordingly, in Tables IV. V. and VI. the fourteen seasons are classified as stated below. There are given the average monthly mean temperatures and rainfall for each class, the difference between the result for each class and the average for a number of years, and the difference between the result for one class and another. The classes are as follows:—

Six years of high produce of both corn and straw; namely, 1832, 1834, 1835, 1854, 1863, and 1864.

Four years of high produce of corn, but not of straw; namely, 1833, 1857, 1868, and 1870.

Four years of very low produce; namely, 1816, 1853, 1860, and 1879.

Of course, the essential character of all averages is to eliminate extremes, and as the class of six seasons of high produce of both corn and straw includes individual seasons differing more widely from one another, both as to temperature and rainfall, than those within either of the other classes, the averages given in the table for that class cannot be taken as showing the character of the class without more of qualification than in the other cases. Admitting this, it will still be found that, taking considerable periods of the seasons—from seed-time to the end of April, and from the beginning of May to harvest, for example—the averages do clearly bear out the general conclusions to which the consideration of the individual seasons has led, in regard to the main characteristics of those periods.

The first class includes the six seasons out of the fourteen which gave the heaviest total produce, corn and straw together; and it is to be observed that it is those seasons of greatest luxuriance of growth, which have also given the most corn per acre.

Confining attention, in the first place, to the period of six months, from November to April inclusive, in only one of the six seasons which go to make the average, were there two months, and in four others there was only one month of the six, of in any material degree lower than average temperature, and

TABLE IV.—SUMMARY of TEMPERATURE of SELECTED SEASONS, CLASSIFIED according to the CHARACTER of their WHEAT CROPS.

Mean Results for each Class, &c.

MONTHS.	Six Seasons of much both Corn and Straw.	Four Seasons of much Corn, but not much Straw.	Four Seasons of Low Produce.	Average of 108 Years, 1771 to 1878.	Six Seasons of much Corn and Straw + or − Average of 108 Seasons.	Four Seasons of much Corn + or − Average of 108 Seasons.	Four Seasons of Low Produce + or − Average of 108 Seasons.	Six Seasons of much Corn and Straw + or − Four of much Corn.	Six Seasons of much Corn and Straw + or − Four of Low Produce.	Four Seasons of much Corn + or − Four of Low Produce.
MONTHLY MEAN TEMPERATURE AT GREENWICH.										
	°	°	°	°	°	°	°	°	°	°
October	51·4	50·1	50·1	49·6	+ 1·8	+ 0·5	+ 0·5	+ 1·3	+ 1·3	0·0
November	43·3	42·2	42·2	42·3	+ 1·0	− 0·1	− 0·1	+ 1·1	+ 1·1	0·0
December	41·4	39·5	38·7	39·2	+ 2·2	+ 0·3	− 0·5	+ 1·9	+ 2·7	+ 0·8
January	39·5	36·7	37·6	36·6	+ 2·9	+ 0·1	+ 1·0	+ 2·8	+ 1·9	− 0·9
February	39·3	40·2	35·4	38·7	+ 0·6	+ 1·5	− 3·3	− 0·9	+ 3·9	+ 4·8
March	42·4	40·8	40·0	41·1	+ 1·3	− 0·3	− 1·1	+ 1·6	+ 2·4	+ 0·8
April	47·4	47·0	43·7	46·1	+ 1·3	+ 0·9	− 2·4	+ 0·4	+ 3·7	+ 3·3
May	53·0	56·0	50·9	52·5	+ 0·5	+ 3·5	− 1·6	− 3·0	+ 2·1	+ 5·1
June	58·6	61·1	56·3	58·2	+ 0·4	+ 2·9	− 1·9	− 2·5	+ 2·3	+ 4·8
July	62·1	64·6	58·3	61·6	+ 0·5	+ 3·0	− 3·3	− 2·5	+ 3·8	+ 6·3
August	61·5	62·0	58·5	60·9	+ 0·6	+ 1·1	− 2·4	− 0·5	+ 3·0	+ 3·5
September	56·8	57·4	54·8	56·5	+ 0·3	+ 0·9	− 1·7	− 0·6	+ 2·0	+ 2·6
Average ..	49·7	49·8	47·2	48·6	+ 1·1	+ 1·2	− 1·4	− 0·1	+ 2·5	+ 2·6

TABLE V.—SUMMARY of RAINFALL of SELECTED SEASONS, classified according to the character of their WHEAT CROPS.

Mean Results for each Class, &c.

MONTHS.	Six Seasons of much both Corn and Straw.	Four Seasons of much Corn, but not much Straw.	Four Seasons of Low Produce.	Average of 63 Years, 1815–'77.	Six Seasons of much Corn and Straw + or – Average of 63 Seasons.	Four Seasons of much Corn + or – Average of 63 Seasons.	Four Seasons of Low Produce + or – Average of 63 Seasons.	Six Seasons of much Corn and Straw + or – Four of much Corn.	Six Seasons of much Corn and Straw + or – Four of Low Produce.	Four Seasons of much Corn + or – Four of Low Produce.
MONTHLY RAINFALL AT GREENWICH.										
	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
October	2·89	2.09	2·91	2·8	+ 0·09	– 0·71	+ 0·11	+ 0·80	– 0·02	– 0·82
November	1·71	1·43	3·46	2·4	– 0·69	– 0·97	+ 1·06	+ 0·28	– 1·75	– 2·03
December	1·92	1·92	1·95	2·1	– 0·18	– 0·18	– 0·15	0·00	– 0·03	– 0·03
January	1·66	2·34	2·15	2·0	– 0·34	+ 0·34	+ 0·15	– 0·68	– 0·49	+ 0·19
February	1·19	1·41	2·01	1·5	– 0·31	– 0·09	+ 0·51	– 0·22	– 0·82	– 0·60
March	1·36	1·24	1·46	1·6	– 0·24	– 0·36	– 0·14	+ 0·12	– 0·10	– 0·22
April	0·66	1·24	2·24	1·7	– 1·04	– 0·46	+ 0·54	– 0·58	– 1·58	– 1·00
May	2·06	0·67	2·73	2·0	+ 0·06	– 1·33	+ 0·73	+ 1·39	– 0·67	– 2·06
June	2·17	1·41	3·81	1·9	+ 0·27	– 0·49	+ 1·91	+ 0·76	– 1·64	– 2·40
July	1·53	1·46	4·07	2·6	– 1·07	– 1·14	+ 1·47	+ 0·07	– 2·54	– 2·61
August	2·26	2·22	3·54	2·4	– 0·14	– 0·18	+ 1·14	+ 0·04	– 1·28	– 1·32
September	2·03	2·10	2·56	2·4	– 0·37	– 0·30	– 0·16	– 0·07	– 0·53	– 0·46
Total	21·44	19·53	32·89	25·4	– 3·96	– 5·87	+ 7·49	+ 1·91	– 11·45	– 13·36

TABLE VI.—SUMMARY of RAINFALL of SELECTED SEASONS, classified according to the character of their WHEAT CROPS.

Mean Results for each Class, &c.

MONTHS.	Six Seasons of much both Corn and Straw.	Four Seasons of much Corn, but not much Straw.	Four Seasons of Low Produce.	Average of 55 Years, 1815–'69.	Six Seasons of much Corn and Straw + or − Average of 55 Seasons.	Four Seasons of much Corn + or − Average of 55 Seasons.	Four Seasons of Low Produce + or − Average of 55 Seasons.	Six Seasons of much Corn and Straw + or − Four of much Corn.	Six Seasons of much Corn and Straw + or − Four of Low Produce.	Four Seasons of much Corn + or − Four of Low Produce.
NUMBER OF DAYS ON WHICH 0·01 INCH OR MORE FELL AT GREENWICH.										
	Days.	Days.	Days.	Days.	Days.	Days.	Days.	Days.	Days.	Days.
October	17	15	16	14	+ 3	+ 1	+ 2	+ 2	+ 1	− 1
November	11	10	17	13	− 2	− 3	+ 4	+ 1	− 6	− 7
December	15	14	19	12	+ 3	+ 2	+ 7	+ 1	− 4	− 5
January	14	16	18	12	+ 2	+ 4	+ 6	− 2	− 4	− 2
February	11	12	15	11	0	+ 1	+ 4	− 1	− 4	− 3
March	12	12	16	12	0	0	+ 4	0	− 4	− 4
April	7	14	15	11	− 4	+ 3	+ 4	− 7	− 8	− 1
May	12	5	14	11	+ 1	− 6	+ 3	+ 7	− 2	− 9
June	11	8	18	11	0	− 3	+ 7	+ 3	− 7	−10
July	8	9	18	11	− 3	− 2	+ 7	− 1	−10	− 9
August	10	10	18	11	− 1	− 1	+ 7	0	− 8	− 8
September	12	11	15	12	0	− 1	+ 3	+ 1	− 3	− 4
Total	140	136	199	141	− 1	− 5	+ 58	+ 4	− 59	− 63

in only one season (1854) was there a really severe winter month. With these few exceptions every other month of the six within each of the six seasons was either about average or over average, and in many cases very much over average as to temperature. Then as to the rainfall over the same period. In two of the seasons there were two months, and in two there was only one month, with any considerable excess of rain; whilst in the other two there was a deficiency in every month of the six. There were, therefore, in each of the six seasons, four, five, or six of these six months considerably drier than the average.

Next, as to the three months of May, June, and July. In two out of the six seasons, each of the three months was warmer than the average; in two each was colder than the average; and in the remaining two there were warmer and colder months, giving about average mean temperatures. As to the rain of these three months, in one out of the six years there were two of the three, in four there was only one of the three, and in the other in neither month an excess of rain. In one only of the six years was the total rain of the three months over the average; though, in three of the six seasons there was an excess in August.

With these explanations as to the elements making up the averages for the six seasons, it is to be observed that their average mean temperature was higher than that of 108 years, in every month of the twelve; but that the excess was very much greater in the months prior to May than in May and afterwards. In fact, the excess of mean temperature, taking the average of these six seasons of greatest productiveness of both corn and straw, is, notwithstanding the coldness of one or two winter or spring months in individual seasons, very much greater before May than afterwards, and it is, notwithstanding the high summer temperature of two of the years, quite insignificant afterwards. Turning now to the average rainfall: there is less than the average amount in nine months out of the twelve, and in the other three the excess is quite insignificant. It is remarkable, too, that the longest period of deficiency is from seed-time to the end of April; the period during which the temperatures were at the same time more in excess of the average. Further, the only month of any important amount of average excess is June; but Table VI. shows that there was, even in that month, not more than the average number of rainy days; whilst, of course, the higher temperatures, and the growth of the crops, at that period, would tend to counteract any otherwise evil effects from an excess.

Upon the whole, then, the seasons of highest productiveness of all were characterised by higher than average temperatures during most of the winter and the early spring. Some were considerably warmer during the summer also, but the majority were characterised by but little higher, or even lower, than average temperatures in the summer. There was also a prevailing deficiency of rain in the winter and spring, but a less marked deficiency in the summer.

The second class includes four seasons of high produce of corn, but of small produce of straw; and these seasons of high yield gave, on the average, less corn per acre than the seasons of greater total bulk of produce. Here, again, we have higher than average mean temperatures in every month but November and March, and then the deficiency was quite insignificant. But, in these seasons of comparatively small total produce, but of high yield of grain, the distribution of the excess of temperature is exactly the opposite of that observed in the case of the seasons of heaviest gross produce. We have now comparatively insignificant excess of temperature in each month prior to May, but a considerable excess in May and the subsequent months, to harvest. Then as to the rainfall: the only month of the twelve in which there is any excess above the average is January; whilst it is in May, June, and July, the months of excess of temperature, that the deficiency is by far the most marked. It is in these three months too that the number of rainy days is the most below the average.

In the cases, then, of small produce of straw, but of high proportion of corn to straw, the result was associated with little more than fairly average conditions as to temperature during the early stages of development of the plant, but with a considerable excess during the period of active above-ground growth, and of maturation. There is, at the same time, though a considerable total deficiency of rain, a much more marked deficiency during the periods of more active above-ground growth, and of ripening, than during the earlier stages.

The third class of seasons, that including four of unusually low produce, shows very marked differences from either of the foregoing. The averages show an actual deficiency of temperature in ten months out of the twelve; and in only one from seed-time to harvest was there an average excess of any importance, namely, in January. The deficiency of temperature was also more marked in the spring than in the winter, and more in the summer than in the spring. With this great deficiency of average temperature almost throughout, we have also, almost throughout, an excess of rain; and the excess is very much the greater in April and afterwards up to harvest than previously. The number of rainy days is also greatly in excess, especially in the summer months. Very low productiveness was, then, associated with both low temperatures and excess of rain, especially during the periods of more active above-ground growth and ripening.

An examination of the last three columns of the Tables will bring to light the differences, not between each class of seasons and the average, but between class and class.

Comparing with one another the seasons of both greatest total produce and highest produce of corn also, with those of comparatively low total produce, but of high yield of grain, it will be seen how prevailingly higher was the average mean temperature from seed-time to April inclusive, how much lower it was in May and afterwards, and also how much greater was the fall of rain during May and afterwards, in the seasons of high total produce, than in those of high corn only. The last two columns, again, show in a striking manner the differences as to temperature and rainfall which distinguish, in the one case the seasons of high produce of both corn and straw, and in the other those of high produce of corn but not of straw, from the seasons of unusually defective produce.

From the foregoing review and comparison of a number of seasons of much more than average productiveness, and of some of the greatest deficiency within a period of sixty-four years, it would appear that mildness, and comparative dryness, of at any rate considerable portions of the winter and early spring, favouring root development, that is, an extended possession of the soil by the plant, and a somewhat early start, have been the characteristics of the most productive seasons. These conditions fulfilled prior to the period of more active above-ground growth, some of the most bulky, and at the same time the most abundant grain crops, ripened under considerably higher than average summer temperatures also, but more of them ripened in summers of scarcely over, or even of under, average mean temperatures; and with, at the same time, but little, if any, less than the average fall of rain during that period. Indeed, the facts show that, with those favourable early conditions, an abundant and high-yielding crop may be obtained with only fairly average, or even under average, summer conditions. But there can be little doubt that, when high summer temperatures, without excess of rain, do succeed upon the favourable conditions of early growth, and of plant, above described, the proportion of grain yielded by the bulky crop will be the greater. It happens, however, that the two both bulky and high-yielding crops which matured in the warmer than average summers were the produce of seasons before the period of our own observations. The less bulky, and somewhat less abundant in grain, but still high-yielding crops have, on the other hand, generally had less favourable conditions for winter root-development, and for early growth in spring, but have been developed under the influence of considerably higher than average summer temperature, with, at the same time, deficiency of rain almost throughout, and a considerable deficiency during the summer months.

The seasons of unusually deficient wheat-crops, on the other hand, have been characterised by severe, or at any rate very changeable, winter and spring conditions, with, at the same time, generally an excess of rain during those periods, frequently saturating the soil, causing much drainage, and discouraging root-development, and early growth in spring. But the more striking characteristic of the bad seasons is a great deficiency of average temperature, and especially a great excess of rain, from the period of active above-ground growth until harvest. The season which gave the extremely deficient crop of 1816 was characterised much more by unusually low temperatures throughout, and especially during the summer months, than by any marked excess of rain excepting during those summer months, and afterwards. The probably even still worse season of 1878–9, though very cold in the winter, was by no means so defective in temperature throughout the spring and summer months as 1816, but there was a great excess of rain, almost throughout the winter, spring, and summer, and a greater excess in the summer than in 1816, though much less afterwards. In a word, the crop of 1816 suffered more from low temperature than excess of rain, and that of 1879 much more from an excess of rain than from low temperature, until the middle of the autumn, after which 1816 continued wet and 1879 became dry.

Lastly, it would appear that any defect of our climate in appropriateness for the production of full and well-matured wheat-crops is more connected with an excess of rain, and consequent wetness of soil and humidity of atmosphere, than with any deficiency of average summer temperature.

II.—THE SEASON OF 1878–79, AND THE EXPERIMENTAL WHEAT-CROPS AT ROTHAMSTED.

Having illustrated the characters of a number of seasons of high and of low productiveness, and especially of the wretched one of 1878–9, by reference to independent records, we now turn to a consideration of the characters of that season at Rothamsted, and of its effect upon the continuous wheat-crops there.

For twenty-seven years (1853–79 inclusive) the rainfall at Rothamsted has been measured by means of a gauge of one-thousandth of an acre area (6 feet × 7 feet 3 inches), and also by an ordinary 5-inch funnel-gauge, which had been in use some time previously.

The amount of the rainfall passing through 20 inches, 40 inches, and 60 inches of soil and subsoil, in their natural state of consolidation, has also been determined for a number of years; and the drainage waters so collected have frequently been analysed. These "*drain-gauges*," also each of one-thousandth of an acre area, were constructed by digging down, and undermining the soil, putting iron plates drilled with holes underneath, and then building round the square of soil in brick and cement. Reference to the amounts of water passing through these *drain-gauges* will be made further on.

The following Table (VII.) shows the rainfall in inches, in each of the twelve months from October 1878 to September 1879 inclusive, as measured by both the large and the small rain-gauge above referred to. It also shows the rainfall recorded, for the same period, at four stations which may be said roughly to be north, south, east, and west of Rothamsted; namely, Bedford, Blackheath, Cambridge, and Oxford. For each place the number of days in each month when 0·01 inch, or more, fell, is also given.

It will be observed that the registries of the large and the small gauge at Rothamsted do not agree very closely during the individual winter months. This is chiefly accounted for by the accumulation or drifting of snow in the large gauge, and perhaps some loss of snow in the small gauge. During the other months the large gauge generally registers slightly more than the small; in those cases chiefly owing to measurable quantities of mist, fog, hoar-frost, &c., being frequently condensed on its large surface when none was collected in the small gauge, or the quantities were too small for measurement.

But the remarkable fact brought out by the Table is, that both the amount of rain, and the number of days on which 0·01 inch, or more, fell, were greater, and in some cases much greater, at Rothamsted than at either of the other stations; and the excess was the most marked in the summer months. Taking the whole twelve months, and adopting the mean of the two Rothamsted measurements, the fall was 8·38 inches more than at Bedford, 6·73 more than at Blackheath, 6·12 more than at Cambridge, and 7·18 more than at Oxford.

The actual amount of fall is not only very large, but it is in excess compared with the average in almost every month, and in the summer months especially very greatly so. Out of the 92 days of May, June, and July, more than 0·01 fell at Rothamsted on 65, leaving only 27 days without any rain, or with less than that amount; and, among the other places quoted,

Table VII.—Rainfall in Inches, and Number of Days on which 0·01 inch, or more, fell, at Rothamsted, Bedford, Blackheath, Cambridge, and Oxford. Twelve Months, October, 1878, to September, 1879, inclusive.

	Rothamsted.			Bedford.	Blackheath.	Cambridge.	Oxford.
	Large Gauge.	Small Gauge.	Mean.				
Rainfall in Inches.							
October 1878.. ..	2·99	2·99	2·99	2·10	1·80	1·92	3·11
November „	4·55	4·73	4·64	3·50	3·53	4·66	2·28
December „	1·60	1·57	1·59	1·46	1·32	1·09	1·51
January 1879.. ..	2·85	2·46	2·66	2·25	2·47	1·98	3·00
February „	3·80	3·74	3·77	2·90	3·95	2·75	3·31
March „	1·18	1·09	1·13	1·00	0·70	0·88	0·88
April „	2·79	2·61	2·70	1·80	2·64	2·18	2·45
May „	3·48	3·46	3·47	3·25	3·37	3·32	2·71
June „	5·55	5·49	5·52	4·35	4·16	5·22	4·54
July „	4·24	4·17	4·20	4·20	3·62	3·49	3·38
August „	6·56	6·47	6·52	4·50	5·12	5·92	5·05
September „	3·13	3·07	3·10	2·60	2·88	2·76	2·89
3 months, Oct.–Dec.	9·14	9·29	9·22	7·06	6·65	7·67	6·90
3 months, Jan.–Mar.	7·83	7·29	7·56	6·15	7·12	5·61	7·19
3 months, April–June	11·82	11·56	11·69	9·40	10·17	10·72	9·70
3 months, July–Sept.	13·93	13·71	13·82	11·30	11·62	12·17	11·32
12 months..	42·72	41·85	42·29	33·91	35·56	36·17	35·11
Number of Days on which 0·01 Inch or more fell.							
October 1878.. ..	22	21	21	14	12	15	15
November „	22	23	23	17	15	21	16
December „	16	16	16	12	14	17	10
January 1879.. ..	13	13	13	7	10	12	9
February „	23	23	23	18	21	23	22
March „	14	14	14	10	14	17	13
April „	20	19	19	14	18	21	16
May „	18	18	18	16	17	19	16
June „	26	26	26	24	18	26	27
July „	21	21	21	22	18	22	19
August „	18	17	18	15	19	17	17
September „	14	14	14	14	14	13	15
3 months, Oct.–Dec.	60	60	60	43	41	53	41
3 months, Jan.–Mar.	50	50	50	35	45	52	44
3 months, April–June	64	63	63	54	53	66	59
3 months, July–Sept.	53	52	53	51	51	52	51
12 months..	227	225	226	183	190	223	195

the number of the so-reckoned rainy days in those three months was exceeded only at Cambridge, though the total amount of rain there was less. In the night of August 2–3, a thunderstorm of great severity occurred, during which 3 inches or more of rain fell within a very few hours. With such a season we could obviously expect nothing but disaster to the wheat-crop; and from the comparisons given we should be prepared to find that the injury was greater at Rothamsted than in many other places.

The next Table (VIII.) shows the produce on some selected plots in the permanent wheat-field at Rothamsted in 1879, compared with the average on the same plots, and with the same manures every year, over the previous twenty-seven years:—

TABLE VIII.—PRODUCE of WHEAT on selected PLOTS at ROTHAMSTED, in 1879, compared with the AVERAGE of 27 YEARS.

	Dressed Corn.				Straw per Acre.	
	Quantity per Acre.		Weight per Bushel.			
	Average 27 Years, 1852–'78.	1879.	Average 27 Years, 1852–'78.	1879.	Average 27 Years, 1852–'78.	1879.
	Bushels.	Bushels.	lbs.	lbs.	Cwts.	Cwts.
Plot 3. Unmanured	13½	4¾	57·9	52·5	11¾	6¾
Plot 2. Farmyard-Manure	34⅛	16	60·1	56·8	32¾	20
Plot 7. Mineral manure and 400 lbs. ammonia-salts	33¼	16¼	59·5	56·7	33¾	26⅞
Plot 8. Mineral manure and 600 lbs. ammonia-salts	36⅞	20½	59·2	56·5	40⅜	37¼
Plot 9. Mineral manure and 550 lbs. nitrate soda	38¼*	22	59·2*	56·5	43⅛*	38¾

* Average of 24 years only instead of 27, as the exact manures stated were not applied to Plot 9 during the first 3 years of the 27.

We shall have to consider further on whether, or in what degree, there was a tendency to diminished or to increased produce on these several plots from year to year due, irrespectively of the influence of season, to gradual exhaustion on the one hand, or to accumulation by the continuous application of the respective manures on the other. It will be sufficient here to call attention to the great deficiency, both in the quantity and the quality of the produce, in 1879, compared with the average, on every one of the plots, whether under conditions as to manuring tending to exhaustion or to accumulation.

It will be observed that the greatest proportional deficiency of corn was without manure, and with farmyard-manure; and that the deficiency was the less the higher the artificial manuring. Without manure, there certainly has been a gradual decline of produce from exhaustion; but it is remarkable that there were no less than nine other plots which, as well as the unmanured plot, gave less than 5 bushels of dressed corn in 1879.

The defect in weight per bushel of the dressed corn was great under all the conditions cited; but it was considerably greater without manure than with any of the selected manures.

Lastly, great as was the deficiency in the produce of corn, and in the weight per bushel of the dressed corn, under all the conditions, the proportional deficiency of straw was very much less. Indeed, it was but small with the higher artificial manuring.

It may be said that, from the beginning to the end of the season, the weather fought against the crop. In every month, from seed-time to harvest, excepting in March, the mean temperature was below, and frequently very much below, the average; and the total rainfall was more than 1½ time as much as the average. The winter was very cold and also wet, so that the soil was saturated with water, and there was nothing to tempt the roots to spread, or to penetrate deeply. The low temperature and the great excess of rain in every subsequent month (except March) perpetuated this condition. The above-ground development was, therefore, also weak and unhealthy. Thus, the plant, which luxuriates in a comparatively dry soil and climate, passed its whole existence under exactly opposite conditions; and the result was only what was to be expected.

It has of course long been known that an excess of wet is injurious to the wheat-crop; but it is only comparatively recently that one at least of the material causes of the adverse influence has been clearly made out: namely, the great loss of nitrogen carried off by drainage in the form of nitrates.

In a paper published in this 'Journal' in 1856, Professor Way showed by the analysis of the drainage-waters from several soils, of different description, and differently manured, that whilst in such waters scarcely any ammonia was to be found, there was a variable and sometimes a very large amount of nitric acid, which he considered in all probability due to the oxidation of the nitrogenous organic matter of manures. Judging, however, from the results he had obtained, showing the power of soils to absorb ammonia, he was unwilling to believe in the conversion of ammonia into nitric acid within the soil. He further said that, considering how very great in some cases the quantities of nitric acid in the drainage-waters were—"we might be seriously impressed with the significance of the fact, were it not that we know that these waters are extrême instances, and that in all probability such a loss rarely if ever occurs in ordinary farming." And, he goes on to say that Mr. Paine, the drainage-water from whose soil had yielded so much nitric acid, was in the habit of using on his land large quantities of such substances as hair, horn shavings, woollen rags, &c., to which in all probability this large quantity of nitric acid is to be referred.

In our own experiments we had for many years found, especially in the case of grain-crops, that, of the nitrogen supplied in manure, a large proportion remained unrecovered in the increase of produce. It was found that when a given amount of nitrogen was supplied year after year, and the same description of crop was grown for a series of years in succession, generally less than half as much as had been supplied was recovered in the increase of crop. It was further found that, if the application of the nitrogenous manure were discontinued, only a very small proportion of the missing amount of nitrogen would be recovered each year in the succeeding crops.

At first we were disposed to consider that this loss of nitrogen of manure might, in part at least, be explained by reference to the vital actions of the plant itself, as it had been concluded by various experimenters that plants evolved nitrogen by their leaves during growth. But, reference to the brief history of the progress of knowledge on the subject given in our paper—"On the Growth of Barley for Twenty Years in Succession on the same Land"—(this 'Journal,' vol. ix., s.s., part 2, pp. 331 *et seq.*) will show that, in 1861, we had come to rely much more on accumulation within the soil, and on loss by drainage, to account for the missing amount of the nitrogen of manure; and that, as more and more evidence on these points was forthcoming, we attributed more and more of importance to drainage as a source of loss.

In the autumn of 1866, finding that Dr. Voelcker was desirous to investigate the question of land drainage, we gladly provided him with samples of the drainage-water from the differently manured plots in the experimental wheat-field, and also with full particulars of their history for the purposes of inquiry. The samples were collected at five different periods, and Dr. Voelcker gave a summary of the results of complete analyses of 65 samples of such drainage-waters of accurately known history, in a paper in the 'Journal of the Chemical Society of London' in 1871 (vol. xxiv., p. 276); and he gave the results more in detail, and with more of reference to their agricultural bearings, in a paper "On the Composition of Waters of Land Drainage," published in this 'Journal' in 1874. Dr. Voelcker determined not only the ammonia and the nitric acid in the drainage-waters, but also the whole of the mineral constituents.

Dr. Frankland also, at his own request, was supplied with numerous samples, not only of the drainage-waters from the different plots of the permanent wheat-field, but of those collected at the depths of 20, 40, and 60 inches respectively, from the "*drain-gauges*" already described; and also of the rain-water collected in the large gauge at Rothamsted. In all he analysed nearly 70 samples of rain-water, and more than 100 of drainage-waters so collected. He determined in them the carbon, the nitrogen in the different forms of combination in which it existed, and the chlorine. His results are published in full in the Sixth Report of the Rivers Pollution Commission, presented to Parliament in 1874. In that Report we have a complete history of the waters of Great Britain, both above ground and under ground. We have the composition of the rain, the changes it undergoes in passing over or through various geological strata, and its condition as it appears again in rivers and springs.

The dates of collection of the samples of drainage-waters analysed by Dr. Voelcker ranged from December 1866 to December 1868; and those of the rain and drainage-waters analysed by Dr. Frankland from January 1868 to February 1873. More recently, the investigation has been continued in the Rothamsted Laboratory, and we have now a large number of results, which will be made the subject of a paper very shortly. In the meantime it will be sufficient for our present purpose to draw some illustrations from the already published results of Dr. Voelcker and Dr. Frankland.

At the conclusion of our paper "On the Effects of the Drought of 1870" (vol. vii., s.s. part 1, of this 'Journal'), we were enabled, by the courtesy of Dr. Voelcker and Dr. Frankland, none of whose results were then published, to point out how very large might be the loss of nitrogen from the land in the winter after the application of ammonia-salts in the autumn. And in our paper on the "Growth of Barley for Twenty Years in Succession on the same Land," in this 'Journal,' vol. ix., s.s., part 2, p. 334 *et seq.*, 1873, will be found tabular summaries of their results, and also a discussion of them.

In the following Table (IX.) is given a summary of some of the results of Dr. Voelcker and Dr. Frankland, in a different form from that above referred to. The object of the arrangement now adopted is, not only to indicate how great may be the loss suffered by the passing away of the nitrogen of manures in the form of

Table IX.—Composition of the Drainage-water collected at different Periods of the Season, from Plots differently manured; Broadbalk Field, Rothamsted; Wheat every Year, commencing 1844.

Nitrogen as Nitrates and Nitrites, per 100,000 parts of Drainage-water. Abstract of Dr. Voelcker's, and Dr. Frankland's Results.

	Ammonia-salts Autumn Sown, Nitrate Soda Spring Sown.			
	From Autumn Sowing to Spring Sowing.		From Spring Sowing to next Autumn Sowing.	
	Number of Collections.	Nitrogen per 100,000 Drainage.	Number of Collections.	Nitrogen per 100,000 Drainage.
Plot 5. Mixed mineral manure alone	7	0·622	4	0·067
Plot 6. Mixed mineral manure, and 200 lbs. ammonia-salts = 41 lbs. nitrogen	7	1·242	4	0·082
Plot 7. Mixed mineral manure, and 400 lbs. ammonia-salts = 82 lbs. nitrogen	7	2·182	4	0·146
Plot 8. Mixed mineral manure, and 600 lbs. ammonia-salts = 123 lbs. nitrogen	7	2·737	4	0·237
Plot 9. Mixed mineral manure, and 550 lbs. nitrate-soda = 82 lbs. nitrogen	6	1·019	4	2·066

nitrates in the drainage, but to show how much greater is the loss during the winter than during the later periods of the season, when the manures are autumn sown.

The results in the Table relate to a period when the ammonia-salts were applied to the plots in question in the autumn, and the nitrate of soda only in the spring. In the first division is given the average composition of all the drainage-waters collected between the date of sowing the ammonia-salts in the autumn and that of sowing the nitrate in the spring; and in the second division the average of those collected after the sowing of the nitrate, and before the next autumn sowing.

Looking to the first division, relating to the samples collected during the winter, after the autumn sowing of the ammonia-salts, and comparing the results of plot 5 with mineral manure without ammonia-salts, with those of plots 6, 7, and 8, which had the same mineral manures, but with more and more of ammonia-salts in addition, it is seen that there was, not only much more nitrogen as nitric acid in 100,000 parts of the drainage-waters where ammonia-salts were applied than where they were not, but that there was a gradual increase in the amount thus drained away and lost, with the increase in the amount of ammonia-salts applied.

Comparing the figures relating to the same plots in the second division with those in the first, it will be noticed how very much less, indeed how very small, is the quantity of nitrogen as nitrates in a given quantity of the drainage-water collected after the conclusion of the winter period. Not only have the autumn-sown manures already been subject to a great loss during the winter, but vegetation is now more active, and more and more rapidly takes up and utilises the nitrates, and so serves to arrest their passage downwards. Further, with the increasing growth, and the increasing temperature, evaporation is increased, and the proportion of the rainfall which drains away is diminished. In fact, so far as can be judged from the data at command, the amount of water passing through the soil will, in ordinary seasons, be several times as much during the first four or five months after autumn-sowing and before the commencement of active above-ground growth, as afterwards to harvest. In the case of the autumn-sowing of the ammonia-salts there is, therefore, not only a much larger quantity of nitrogen as nitrates in a given quantity of drainage-water, but there is also a much larger quantity of water passing as drainage, during the winter than afterwards.

Lastly in regard to the results relating to the autumn-sown ammonia-salts, it will be observed that although the quantity of nitrogen as nitrates in a given quantity of the drainage-water collected after the winter, and after the commencement of more active growth, is very small, it is, as in the case of the samples collected during the winter, and sooner after the application, the greater, the greater the amount of ammonia-salts applied.

We have yet to notice the results obtained from the plot manured with nitrate of soda, which was always applied in the spring, and generally between the middle and the end of March. It is seen that the drainage from this plot was much richer in nitrates after the application of the nitrate in the spring than it was during the winter before the fresh application. Still, considering the great solubility of the nitrate, the little power of the soil to retain it, the fact that a crop had been grown and removed since the previous application, and the great quantity of drainage passing during the winter, the average amount of nitrogen as nitrates in the samples collected in the autumn and winter months is greater than would be expected compared with that from the plots manured with the ammonia-salts in the autumn. Nor is the average amount in the drainage collected after the application of the nitrate so high as might be expected; though the amount has been found to be very high in individual cases of drainage collected soon after the spring dressing.

Lastly, to facilitate the appreciation of the significance of the results given in the Table, it may be observed that, for every inch of rain passing beyond the reach of the roots, and containing one part of nitrogen as nitrates per 100,000 parts of water, there will be a loss of rather more than 2¼ (2·26) lbs. of nitrogen per acre; corresponding to about 11 lbs. of the "ammonia-salts," or to about 14½ lbs. of nitrate of soda. And, as illustrating how very great may be the loss when heavy rain and much drainage follow soon after the application of heavy dressings of ammonia-salts or nitrate of soda, it may be mentioned that one sample of drainage-water collected early in January 1872, after the application of 600 lbs. of ammonia-salts early in November, was found by Dr. Frankland to contain so much nitrogen as nitrates as to represent a loss of 18 lbs. of nitrogen per acre, corresponding to about 86 lbs. of the "ammonia-salts," or to about 114 lbs. of nitrate of soda, provided an inch of rain had passed away as drainage of that strength; which, however, was probably not the case. Again, in one case of the Rothamsted analyses, the drainage-water collected on April 7th from the plot which had been dressed with 550 lbs. of nitrate of soda on March 10, contained so much nitrogen as nitrates as to represent a loss of about 15½ lbs. of nitrogen per acre, corresponding to about 76 lbs. of the "ammonia-salts," or to about 100 lbs. of nitrate of soda, provided that (which again was probably not the case) an inch of rain had passed as drainage of that strength.

It should be added that, besides nitrogen as nitrates and nitrites, land drainage-waters always contain more or less as ammonia or as organic nitrogen, but the quantity passing away in these forms is quite insignificant compared with that lost as nitrates.

In consequence of the very conclusive evidence of the great loss by drainage of the nitrogen of ammonia-salts applied in the autumn, especially in wet winters, it was decided, in the autumn of 1872, to devote one plot in the experimental wheat field to the application of the ammonia-salts in the spring. Accordingly, plot 15, which had for many years been manured with approximately the same mineral manures, and approximately the same amount of nitrogen, as plot 7, was selected; and, from that time, precisely the same mineral manures, and precisely the same amount of ammonia-salts were applied to plot 15 as to plot 7. To both plots the mineral manures were, as before, applied in the autumn; to plot 7 (as to all the other ammonia-plots), the ammonia-salts also were applied in the autumn, but to plot 15 they were not applied until the spring. For the five crops, from 1873 to 1877 inclusive, this arrangement was continued. It happened that four out of the five seasons were wetter than the average, and especially during the winter months. The consesequence was that, in the two wettest seasons the result was very much against the autumn sowing; in two less excessively wet ones it was about equal; and, in the season of 1874 alone, the winter of which was dry, it was very decidedly in favour of autumn sowing. After the harvest of 1877, therefore, it was decided that plot 7, and all the other plots which had hitherto received ammonia-salts in the autumn, should not receive them until the spring, and that, for comparison with plot 7, plot 15 should now receive its ammonia-salts in the autumn.

The following Table (X.) shows the bushels of corn, and the weight of straw, and of total produce, obtained in each of the seven years, from 1873 to 1879 inclusive, by autumn sowing, and by spring sowing, respectively, of the ammonia-salts.

TABLE X.

SEASONS.	Dates of Sowing Ammonia-salts.		Corn, Straw, and Total Produce per Acre.					
			Corn.		Straw.		Total Produce.	
	Autumn.	Spring.	Autumn Sown.	Spring Sown.	Autumn Sown.	Spring Sown.	Autumn Sown.	Spring Sown.
			Bushels.	Bushels.	lbs.	lbs.	lbs.	lbs.
1873	Oct. 18	Mar. 25	22	32⅛	2021	3079	3344	5031
1874	„ 28	„ 19	39⅜	29⅛	4645	2776	7094	4588
1875	„ 23	„ 23	25⅞	25½	3422	3204	5110	4915
1876	„ 30	„ 24	23½	25½	2212	2428	3793	4083
1877	„ 17	Apr. 11	19⅞	33⅛	1835	2788	3048	4795
1878	Nov. 3	Mar. 14	22⅛	31¼	3071	4952	4486	7017
1879	Oct. 15	„ 10	5⅜	16¼	906	3012	1275	4063
Averages	..	..	22½	27¾	2587	3177	4021	4927

It will be observed that, in 1874 alone, was the result decidedly in favour of autumn sowing. In 1873, 1877, 1878, and 1879, it was decidedly against autumn sowing; whilst, in 1875 and 1876, the difference was immaterial.

In Table XI. (page 206) is shown :—

1. The increase or diminution of produce by spring sowing.
2. The rainfall in each season, from the date of autumn sowing to that of spring sowing, and from that of spring sowing to the end of June, as measured by the large gauge at Rothamsted.
3. The amount of drainage passing through 60 inches of soil in the "drain-gauge" during the same periods.

As already said, we have no means of gauging the amount

TABLE XI.

SEASONS.	Dates of Sowing Ammonia-salts.		Produce More (+) or less (–) by Spring Sowing.			Rainfall, Large Gauge.		Drainage (60 Drain Gaug	
	Autumn.	Spring.	Corn.	Straw.	Total.	From Autumn to Spring Sowing.	From Spring Sowing to end of June.	From Autumn to Spring Sowing.	F Sp So to e J
			Bushels.	lbs.	lbs.	Inches.	Inches.	Inches.	In
1873	Oct. 18	Mar. 25	+ 10⅝	+1058	+1687	18·53	4·39	11·45	0
1874	„ 28	„ 19	– 10¼	–1869	–2506	7·05	5·12	2·89	0
1875	„ 23	„ 23	– 0⅜	– 218	– 195	10·55	7·89	5·21	0
1876	„ 30	„ 24	+ 2	+ 216	+ 290	12·17	6·12	10·14	1
1877	„ 17	Apr. 11	+ 13¼	+ 953	+1747	22·01	4·90	15·78	0
1878	Nov. 3	Mar. 14	+ 9⅛	+1881	+2531	11·17	12·30	8·11	5
1879	Oct. 15	„ 10	+ 10⅞	+2106	+2788	15·05	12·86	13·09	4
Averages	..	..	+ 5¼	+ 590	+ 906	13·79	7·65	9·52	2

of drainage from the different plots in the experimental wheat-field. But the record of the amount of the rain passing through 60 inches of soil and subsoil in one of the "drain-gauges" described at p. 196, will at any rate give some idea of the characters of the different seasons in regard to drainage. As the soil of the "drain-gauge" is without vegetation, the amounts of drainage passing through it during the winter, that is from the date of autumn sowing to the date of spring sowing, will doubtless more nearly represent the relative, and in some degree the actual, amounts passing through the soil of the wheat-field during that period than afterwards. But, after active vegetation has commenced, the drainage would doubtless be proportionally less in the wheat-field than through the bare drain-gauge soil.

From what has been shown in the former part of this paper, it will be obvious that the exact differences in the amount of produce obtained by autumn and by spring sowing respectively, in the different seasons, cannot be at all adequately explained by the abstract given of rainfall and drainage alone. To do this, it would be necessary to go into detail as to the distribution of the rain, the coincident temperatures, and the condition of progress of the growing crop. But to bring prominently to view the effect of loss by drainage, it will be well to confine attention to the two extreme cases; the one in which the highest, and the other in which the lowest produce, of both corn and straw, was obtained after the autumn sowing of the ammonia-salts. These are 1874 and 1879.

In 1874 there was obtained not only much more produce, both corn and straw, by autumn than by spring sowing; but by autumn sowing there was then obtained the highest produce in the series, whether by autumn or by spring sowing. In 1879, on the other hand, autumn sowing gave not only much less than spring sowing, but much less than in any of the other cases of either autumn or spring sowing.

The following summaries bring prominently into contrast the produce of the two seasons, and the characters of the seasons themselves :—

Produce.

	Ammonia-salts, Autumn Sown.			Ammonia-salts, Spring Sown.			More (+) or less (−) by Spring Sowing.		
	Corn.	Straw.	Total.	Corn.	Straw.	Total.	Corn.	Straw.	Total.
	Bushels.	lbs.	lbs.	Bushels.	lbs.	lbs.	Bushels.	lbs.	lbs.
1874	39⅜	4645	7094	29⅛	2776	4588	−10¼	−1869	−2506
1879	5⅜	906	1275	16¼	3012	4063	+10⅞	+2106	+2788
1874 + or − 1879	+34	+3739	+5819	+12⅞	−236	+525			

Rainfall, and Drainage through 60-Inch "Drain-Gauge."

	From Autumn Sowing to Spring Sowing.		From Spring Sowing to end of June.		Total From Autumn Sowing to end of June.	
	Rainfall.	Drainage.	Rainfall.	Drainage.	Rainfall.	Drainage.
	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
1874	7·05	2·89	5·12	0·25	12·17	3·14
1879	15·05	13·09	12·86	4·95	27·91	18·04
1874 + or − 1879	− 8·00	−10·20	− 7·74	− 4·70	−15·74	−14·90

Thus, in 1874, the autumn-sown ammonia-salts gave 39⅜ bushels of corn and 4645 lbs. of straw ; and 10¼ bushels more corn, and 1869 lbs. more straw, than the spring-sown ammonia. With this heavy crop by autumn-sown ammonia, and much heavier than by the spring sown, there were only 7·05 inches of rain from the date of autumn sowing to that of spring sowing, and only 2·89 inches of drainage through the 60-inch drain-gauge, during the same period. Then again, from the date of spring sowing to the end of June, there were only 5·12 inches of rain, and only 0·25 inch of drainage through the 60 inches of uncropped soil. It would appear that the small amount of winter rain was sufficient to aid the conversion of much of the ammonia of the manure into nitric acid, and for its distribution through the soil, favouring root-development; but that it was not sufficient for much loss by drainage. On the other hand, it would seem that the small amount of rain after the spring sowing, when both the progress of vegetation and the increasing temperature would serve to increase evaporation, was insufficient for the necessary conversion and distribution of the nitrogen of the spring-sown ammonia-salts.

Contrast this result, and these conditions, with those of 1879. In 1879 we have only 5⅜ bushels of corn, and only 906 lbs. of straw, with the autumn-sown ammonia-salts; or 34 bushels less corn, and 3739 lbs. less straw, than by the same manures sown in the autumn for the crop of 1874. Coincidently with this result we have, for the season of 1879, 15·05 inches of rain, and 13·09 inches of drainage through 60 inches of soil, from the date of autumn sowing to that of spring sowing; or 8 inches more rain, and 10·2 inches more drainage, than over the same period for the crop of 1874. In 1879, however, we have 16¼ bushels of corn, and 3012 lbs. of straw, or 10⅞ bushels more corn, and 2106 lbs. more straw, by spring sowing than by autumn sowing; and there were from the date of spring sowing to the end of June 12·86 inches of rain, and 4·95 inches of drainage through 60 inches; or 7·74 inches more rain, and 4·7 inches more drainage, than during the same perod in 1874. Further, whilst the drain-pipes in the experimental wheat-field did not run more than twice from the date of autumn sowing to that of spring sowing in the season of 1873–4, in the corresponding period of 1878–9 they ran about twenty times; and again, whilst from the date of spring sowing to the end of June they did not run at all in 1874, they ran six or seven times during the corresponding period in 1879. It is remarkable, that there was even more straw, though there was not more total produce, by spring sowing in the wet season of 1879, than in the dry one of 1874.

There can be no doubt that, in the season of 1878–9, there was an enormous loss by drainage from the autumn-sown ammonia-salts, not only during the winter, but also more or less afterwards; and that there was also a considerable loss from the spring-sown ammonia. In the season of 1873–4, on the other hand, whilst there seems to have been a sufficiency of rain during the winter for the action of the autumn-sown manure, it would appear that there was an actual deficiency for the proper action of the spring-sown ammonia-salts; resulting in even rather less straw, though still much more corn, than was obtained under the conditions of loss by drainage in 1879.

The quantity of ammonia-salts annually applied to each of these two plots is estimated to contain 82 lbs. of nitrogen; and the crops obtained in the two years in question contained the following amounts of nitrogen :—

	Nitrogen in Produce per Acre.								
	Ammonia-salts, Autumn Sown.			Ammonia-salts, Spring Sown.			More (+) or less (−) by Spring Sowing.		
	Corn.	Straw.	Total.	Corn.	Straw.	Total.	Corn.	Straw.	Total.
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
1874	37·0	14·5	51·5	28·5	9·1	37·6	− 8·5	−5·4	−13·9
1879	6·6	5·7	12·3	17·6	13·8	31·4	+11·0	+8·1	+19·1
1874 + or − 1879	+30·4	+ 8·8	+39·2	+10·9	− 4·7	+ 6·2	..	..	..

The point of greatest interest is the contrast between the result obtained by autumn sowing in the dry season of 1874, and in the wet one of 1879. Whilst we have, in the produce of 1874, 51·5 lbs. of nitrogen, corresponding to 63 per cent. of the amount supplied, we have, in that of 1879, only 12·3 lbs., corresponding to only 15 per cent. of that supplied. In these calculations no allowance is made for the amount of nitrogen that the respective crops may have derived from the previously existing stores within the soil, irrespectively of the immediate supply by the ammonia-salts. It is obvious that, were any such allowance made, the result would appear even worse than is represented by the figures as they stand. It may be added, that such approximate estimates as we are able to make, founded on the amount of water passing through the 60-inch drain-gauge, and on the analyses of the drainage-waters collected from the autumn-sown plot, from the date of the autumn sowing up to harvest, would indicate an amount of loss of the supplied nitrogen by drainage sufficient to account, in great measure, for the defective yield.

With regard to the results relating to the spring sowing, it need only be noticed how much less of the nitrogen of the manure was recovered in the produce after spring sowing than after autumn sowing in the dry season of 1874 ; and how little more of the nitrogen of the spring-sown ammonia-salts was recovered in the crop in the too dry season of 1874, than in the very much too wet one of 1879, with all its loss by drainage.

The facts adduced can leave no doubt whatever that, independently of other adverse effects arising from low temperatures and excess of rain, the Rothamsted experimental wheat-crops of 1879 suffered very considerably from loss of the nitrogen of the manures by drainage. The question remains—whether land farmed and manured in the ordinary way would suffer in anything like the same degree from the same cause? The results of Professor Way, which have been referred to, clearly show that considerable loss may so arise when animal nitrogenous manures, such as hair, horn shavings, woollen rags, &c., are employed; and results obtained at Rothamsted show that there is a similar loss when vegetable nitrogenous manures, such as rape-cake, are used. Further, the drainage water from the dunged plot in the experimental wheat-field at Rothamsted is sometimes found to contain a considerable amount of nitric acid; but always very much less than that collected at the same time from adjoining plots receiving much less nitrogen as manure, but in the form of ammonia-salts or nitrate of soda. Whilst, therefore, it is to be assumed that the loss of the nitrogen of manure by drainage in the past season was proportionally much greater in the experimental wheat-field at Rothamsted than in the case of land farmed in the ordinary way, there can, nevertheless, be no doubt that much of the land of the country at large must also have suffered great loss in the same way.

XIII.—*The Past Agricultural Year.* By J. C. Morton.

My report of the agricultural experience of the past year will be little more than an edition of the letters of my correspondents. I had made inquiries on the subject early in the summer, in order to ascertain the effect of the unusually wet and cold autumn, winter, and spring on the health of stock, the difficulties of cultivation, and the prospects of the harvest. Answers came to me from all parts of the country from gentlemen farming under a great variety of circumstances; and during the subsequent autumn I received additional information on the final results of the field-work of the year, which are, however, already too well known. The expectation that some definite lessons, perhaps affecting future practice, might be gathered from these reports has scarcely been realised. The disaster has been too general and complete. Even drained land, if arable, may be impossible to cultivate, and, if pasture, may rot sheep in a very wet season; and hay may spoil and potatoes rot and wheat remain unripened, under good and bad management alike, when the downpour is almost continuous. The following pages, accordingly, contain little more than a gloomy picture of almost universal disaster. They contain, first, an exact account of the weather, drawn up by Mr. G. J. Symons, F.R.S., of Camden Square, who has contrasted and compared it with that of two previous noteworthy years, 1860 and 1868: then two reports of personal experience by Mr. Charles Randell and Mr. Charles Whitehead, respectively, members of the Council: and lastly, with but little comment, a large body of evidence, the several witnesses being arranged from north to south according to their several counties.

The following is Mr. Symons' report of the weather of the twelve months ending September 30, 1879:—

THE WEATHER OF 1879.—"In order to realise the full force of meteorological statistics, it is indispensable that we have somewhat wherewith to compare them. Sometimes this is best done by determining the average of a long series of years, and then comparing the facts for a given year with that average. At other times it is best to seek for an analogous period, and also for one possessing exactly opposite characteristics, for by that course the variations to which the climate is liable become readily evident. In preparing the present paper I have used both methods, as sometimes the one and sometimes the other appeared the more expedient.

"The first set of tables give the leading meteorological data for two stations,—Cardington, near Bedford, one of the driest places in England, and Stonyhurst, near Clitheroe, Lancashire, a place having a fall of rain about the average of the west coast of England and Wales. I have selected these stations partly on account of their widely different climate, partly in consequence of their position, partly because observations have been uninterruptedly made at each for nearly a quarter of a century, and partly because I believe the observations to be of better than the average quality. For these two stations I give identical data for three agricultural years—1859-60 (wet and cold), 1867-68 (dry and hot), and 1878-79 (wet and cold). (See Tables I. and II., pp. 213, 214) The general resemblance of 1860 and 1879 is very striking, but, as regards both temperature and rainfall, 1879 was the worse of the two. This is very clearly shown by diagrams Figs. 1 and 2, which represent the mean temperature and the monthly rainfall at the two stations for the three selected years.

"The effect of a given quantity of rain depends materially on the manner in which and the period at which it falls; and I have before me tables, constructed for the illustration of this point, representing the daily fall at three widely-separated stations, London, Bury St. Edmunds, and Worcestershire, for which room is wanting here. From these it is, however, seen that March was the only dry whole month of last year, but that the latter part of January was also dry, and in some parts of England the early parts of August were also nearly rainless.

Fig. 1.—*Curves of Monthly Mean Temperature for the Years* 1859-60, 1867-8, 1878-9.

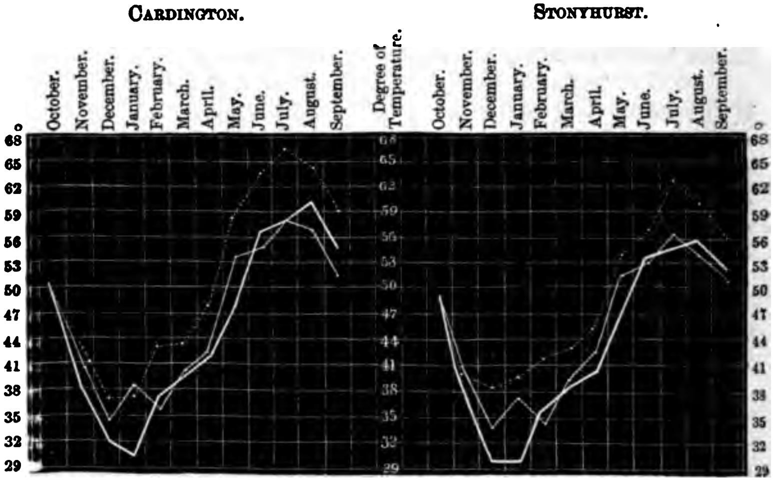
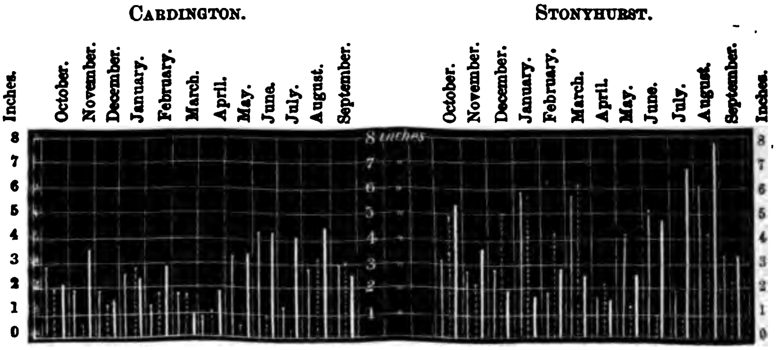


Fig. 2.—*Diagram of Monthly Rainfall for the Years* 1859-60, 1867-8, 1878-9.



In these diagrams the thin white lines represent the year 1859-60, the dotted lines the year 1867-8, and the broad white lines the year 1878-9.

Table I.—Results of Meteorological Observations at Cardington, near Bedford, for the Three Years, 1859–60, 1867–8, 1878–9.

Months.	Temperature.					Mean Amount of Cloud.	Rainfall.	
	Max.	Min.	Mean Max.	Mean Min.	Mean.		Amount.	Number of Days.
1859–1860. (*Cold and wet.*)								
	°	°	°	°	°	0 - 10	Inches.	
October	76·0	21·6	57·9	43·6	50·1	7·6	2·74	13
November	57·0	21·0	47·1	34·1	40·4	5·6	1·85	10
December	56·0	6·0	40·4	28·5	34·8	6·7	1·80	18
January	56·0	26·0	44·3	33·0	38·5	6·1	2·50	17
February	52·4	19·4	41·4	29·1	35·9	6·1	1·20	14
March	60·0	26·6	48·2	34·6	40·7	6·8	1·60	19
April	66·6	26·0	52·1	34·4	42·6	6·5	·80	16
May	75·0	31·0	65·3	44·9	53·9	1·0	3·26	15
June	71·0	40·0	65·4	48·9	54·8	8·0	4·32	26
July	76·4	40·0	68·0	49·8	57·9	7·5	1·34	12
August	72·4	43·0	66·9	50·9	57·2	7·4	2·80	25
September	68·6	32·0	61·7	44·2	52·3	7·1	3·00	13
Mean	65·6	27·7	54·9	39·7	46·6	6·4	27·21	198
1867–1868. (*Hot and dry.*)								
October	67·0	29·0	56·4	40·5	48·4	6·3	1·90	17
November	60·4	23·6	47·5	35·2	41·1	6·5	·40	5
December	56·4	12·6	43·3	30·7	37·1	7·5	1·40	14
January	55·0	24·0	41·4	34·3	37 7	8·0	2·80	18
February	61·0	25·0	50·1	37·0	43·4	6·2	1·50	10
March	60·0	26·4	52·1	36·0	43·8	6·4	1·64	15
April	67·0	25·0	58·4	38·5	47·7	6·8	1·13	9
May	88·0	32·0	71·2	45·6	58·7	4·5	·60	4
June	88·4	40·0	76·1	49·6	63·5	4·2	1·00	5
July	95·4	46·0	80·4	54·8	66·8	4·4	·15	2
August	92·0	45·0	74·9	53·9	63·7	6·0	3·20	8
September	90·4	38·0	69·6	48·7	59·1	5·4	3·20	10
Mean	73·4	30·6	60·1	42·1	50·9	6·0	18·92	117
1878–1879. (*Cold and wet.*)								
October	70·6	29·6	57·6	43·1	50·1	5·5	2·10	14
November	51·4	27·0	44·2	33·6	38·7	7·6	3·50	17
December	53·4	12·0	36·6	26·9	32·1	7·6	1·46	12
January	46·0	16·0	34·6	25·5	30·2	7·6	2·25	7
February	54·6	17·6	43·1	32·9	37·6	8·2	2·90	18
March	61·0	27·0	48·6	33·2	40·5	6·5	1·00	10
April	61·4	28·0	51·3	35·1	42·0	7·5	1·80	14
May	68·6	26·6	58·1	39·5	47·6	7·0	3·25	16
June	73·0	39·0	67·5	49·6	56·8	7·8	4·35	24
July	79·6	43·6	67·9	51·4	58·1	8·4	4·20	22
August	77·0	45·4	69·3	52·3	59·8	6·0	4·50	15
September	70·0	37·0	63·5	47·1	54·9	6·2	2·60	14
Mean	63·9	29·1	53·5	39·2	45·7	7·2	33·91	183

Table II.—Results of Meteorological Observations at Stonyhurst College, seven miles North of Blackburn, for the Three Years, 1859–60, 1867–8, 1878–9.

Months.	Temperature.					Mean Amount of Cloud.	Rainfall.	
	Max.	Min.	Mean Max.	Mean Min.	Mean.		Amount.	Number of Days.
	1859-1860. *(Cold and wet.)*							
						0 - 10	Inches.	
October	71°·7	25°·2	53°·4	42°·0	47°·9	7·3	3·30	20
November ..	55·1	24·9	46·7	35·2	40·7	6·5	2·80	18
December ..	52·3	12·7	39·2	28·9	33·9	6·6	2·90	14
January ..	53·1	17·7	42·2	32·4	37·3	7·0	4·90	25
February ..	46·4	19·1	41·1	29·7	34·8	6·5	1·70	16
March	51·6	21·0	45·0	34·1	39·3	7·2	5·80	26
April	62·4	28·4	51·0	35·5	42·6	6·0	1·60	13
May	73·6	31·3	69·8	43·0	51·4	6·5	4·00	21
June	67·6	40·2	61·2	47·5	53·1	9·5	6·10	26
July	75·0	42·3	67·2	49·6	56·2	7·6	1·70	14
August	69·2	41·2	62·0	49·0	53·8	8·7	6·10	29
September ..	83·6	34·7	60·6	45·0	51·3	6·9	3·30	18
Mean ..	63·5	28·2	53·3	39·3	45·2	7·2	44·20	240
	1867-1868. *(Hot and dry.)*							
October ..	66·4	30·3	54·0	42·2	47·4	7·7	5·10	23
November ..	53·1	26·1	46·4	35·5	40·4	6·9	2·10	9
December ..	61·0	22·0	43·3	33·6	38·3	7·4	4·90	22
January ..	54·4	25·2	43·7	34·8	39·0	8·1	3·60	21
February ..	53·1	25·6	46·9	37·1	41·8	7·5	4·20	24
March	58·0	26·2	50·0	36·9	43·0	7·2	6·10	23
April	61·8	28·9	54·1	40·2	45·6	6·9	2·20	16
May	80·0	31·9	64·8	46·4	53·8	6·3	1·50	20
June	83·0	41·5	69·1	48·1	56·5	6·3	·70	17
July	88·1	43·2	75·6	53·8	62·5	5·2	·70	9
August	88·0	44·8	70·9	53·4	60·3	6·0	4·30	22
September ..	85·0	40·0	65·2	49·4	56·0	5·6	2·40	15
Mean ..	69·3	32·1	57·0	42·6	48·7	6·8	37·80	221
	1878–1879. *(Cold and wet.)*							
October ..	69·2	27·8	56·0	44·1	49·4	8·8	5·42	24
November ..	50·0	25·8	43·4	33·0	37·5	8·6	3·77	17
December ..	50·5	13·1	36·9	24·3	30·3	7·3	2·03	16
January ..	46·0	17·3	35·9	25·0	30·2	6·9	1·53	8
February ..	50·3	24·8	40·7	32·4	36·0	9·5	2·70	21
March	54·8	24·3	46·5	33·9	39·1	8·6	2·51	16
April	59·9	27·5	50·2	34·6	40·7	7·3	1·56	16
May	64·8	30·0	57·1	39·7	46·7	7·6	2·38	21
June	70·0	38·0	63·7	47·9	53·6	8·7	4·79	24
July	74·2	42·8	63·2	50·4	54·7	9·5	6·79	26
August	77·0	41·0	65·2	49·7	55·9	8·5	7·71	22
September ..	71·0	34·0	61·4	46·3	52·9	7·3	3·40	20
Mean ..	61·5	28·9	51·7	38·4	43·9	8·2	44·59	231

TABLE III.—COMPARISON of the RAINFALL of 1878–79 with the ANNUAL AVERAGE.

STATIONS.	Total Rainfall November, 1878, to October, 1879.	Average Annual Rainfall.	Excess of 1878–9 over Average.	Deficiency of 1878–9 under Average.	Excess per cent. of Average.	Deficiency per cent. of Average.
	Inches.	Inches.	Inches.	Inches.		
Bury St. Edmunds, Cufford	35·74	23·61	12·13	..	51	..
London, Camden Square ..	36·64	25·02	11·62	..	46	..
Shifnal, Houghton Hall ..	34·76	23·73	11·03	..	46	..
Hitchin	32·91	23·25	9·66	..	42	..
Boston	29·91	21·72	8·19	..	38	..
Banbury, High Street ..	34·02	25·24	8·78	..	35	..
Cirencester	41·46	30·87	10·59	..	34	..
Bridport	40·42	32·45	7·97	..	25	..
North Shields	33·82	27·22	6·60	..	24	..
Bodmin	56·74	46·11	10·63	..	23	..
Tenbury, Orleton	37·60	30·56	7·04	..	23	..
Haverfordwest	56·05	47·17	8·88	..	19	..
Barnstaple	45·45	39·51	5·94	..	15	..
Maidstone, Hunton Court	28·83	25·13	3·70	..	15	..
Manchester, Ardwick ..	35·10	30·92	4·18	..	14	..
Llandudno, Warwick House	32·19	30·09	2·10	..	7	..
York	24·53	23·38	1·15	..	5	..
Skipton, Arncliffe	53·80	56·40	..	2·60	..	5
Keswick, Scathwaite ..	105·62	153·46	..	47·84	..	31

"One other Table (III.) is necessary, in order to realise the relative severity of the injury sustained. In this table records from about twenty widely-scattered stations are grouped in the order of the excess of the fall of the twelve months 1878–9 above the average. Bury St. Edmunds has experienced most, and therefore heads the list. The total fall at that station in the twelve months ending October 31st, 1879, was 35·74 inches, whereas the average fall in twelve months is only 23·61 inches; the fall was therefore 12·13 inches above the average, or the excess amounted to 51 per cent. of the mean, *i.e.* rather more than half as much again as the usual amount. Middlesex and Shropshire follow next with nearly equal excess; and then we gradually come to North Devon, Maidstone, Manchester, North Wales, and York where the excess was unimportant; and finally we finish with North-West Yorkshire and Cumberland, in each of which districts the twelve months have actually been drier than the average. If these percentage excesses are placed upon a map it will be found that they environ the county of Huntingdon in all directions, and render it certain that the excess of rainfall has been greater over the midland and eastern counties of England than elsewhere. Guided by this alone, one would expect that residents in those districts have suffered more than those elsewhere. But these broad features will necessarily be modified by the fact that the *date* of the rainfall makes all the difference to the crops. This is so obvious to every agriculturist, that I need say no more respecting it.

"Observations respecting the amount of sunshine made in a manufacturing locality like Greenwich are necessarily impaired by the prevalence of smoke; but remembering and making full allowance for that fact, and remembering also that in summer the sun is above the horizon 16 hours per diem, in winter 8 hours per diem, and on the average of the whole year 12 hours per diem, the following table shows a deficiency almost greater than seems credible."

Average Daily Duration of Sunshine at Greenwich.

	Hrs.	Min.		Hrs.	Min.
November, 1878	1	24	May, 1879	4	24
December, 1878	0	30	June, 1879	4	42
January, 1879	0	30	July, 1879	3	12
February, 1879	1	6	August, 1879	4	30
March, 1879	2	54	September, 1879	3	54
April, 1879	2	30	October, 1879	2	12

Average per diem, 2 hours 39 minutes sunshine.
" " 9 hours 21 minutes cloudy.
" " 12 hours sun below horizon.

"Having thus described the season meteorologically, let us now examine its agricultural character. For the collection of evidence on this point I addressed a letter of inquiry last July to a number of leading tenant farmers in the several counties between the extreme north and south of the island, stating as follows the particulars on which information was desired, and the questions on which the experience of the year might, it was thought, be expected to throw light:—

1. *As to the health of the live stock* of the farm, will you tell me your experience as to the drop of lambs and the health of the ewe flock; and, generally, as to the influence of the prolonged winter and the wet spring on the health of horses, cattle and sheep?
2. *As to the crops of the farm*, one would like to know in a number of instances the effect of the winter on the wheat crop, on particular varieties; and on crops after fallow, clover, beans, respectively: also on the winter bean crop, and on green crops left exposed.
3. *As to fallow operations*, the questions to be answered relate to the influence of land drainage and of autumn cultivation in making the necessary work of spring time easier or possible. Also to the great difficulties of spring and summer fallow work, and their results in the subsequent turnip and mangold crop; which, however, cannot be fully known till later on.

A large quantity of information in answer to this circular soon reached me; and some further evidence has been sent to me during the subsequent winter. A selection from these reports, generally abridged with occasional editorial comment, is, I think, the form in which their subject can be best laid before the reader of the 'Journal.' In the first place I give unabridged the reports which I have received from Mr. C. Randell and Mr. C. Whitehead, Members of the Council.

CHADBURY, NEAR EVESHAM, the farm occupied by Mr. Randell, was described by himself ten years ago ('Journal' of the Society, vol. v., S. S.)—in connection then with the Agricultural Lessons of a Drought. It consists of 490 acres, about 90 of which are in pasture and meadow, the remainder arable, being, as to 100 acres of it, "gravelly soil, fair turnip land; 180 acres of heavy clay land, of fair quality; and 120 acres of very poor clay." Mr. Randell's statement is as follows:—

"*First, as to the long winter*—The effect of this has been partially to destroy the wheat plant upon clay land, especially on the north sides of the ridges, and where sown upon land which had been fallowed, or I should rather say which had been rendered hollow by more than one ploughing: for fallowing clay land last year was impracticable, except during the one month of good weather for haymaking, when only steam-cultivating farmers could take advantage of it. Where these failures occurred wheat has been replanted, but, considering the length and severity of the winter, this has not been necessary to so great an extent as was expected, owing to the absence of wind which, when accompanying hard frost, is always destructive. Winter beans were generally killed, and spring beans or peas were planted in their stead. Vetches, too, suffered from the frost. Another crop, cabbages, suffered greatly: few fields escaped partial or total destruction; where they did escape without material injury it would appear to have been owing to high condition having given such vigour to the plants as enabled them to withstand the action of frost. On this farm a field of rather light land was heavily manured after harvest from a covered yard, and had one ton of soot per acre harrowed in; the cabbage plants, strong ones, from seed sown in July, were set out early in October. When sufficiently rooted, 4 cwt. per acre of guano were applied, and they were horse- and hand-hoed; this saved them, in spite of frost, and the crop—16 acres—was sold at a high price instead of being consumed by sheep. Another field, 13 acres of clay land, was planted after the former one, with no manure except the soot; the frost destroyed fully two-thirds of the cabbages, and the whole piece was drilled across with seed of the thousand-headed cabbage in March. The weather continued cold; the seed was long in vegetating; and, before it was possible to hoe the crop, annual weeds nearly covered the ground. Now we come to the second season—misnamed that year, Spring—and, finishing the answer to your question as to the effects of winter, the history of this piece of cabbages shall be completed. The weeds among them continued to grow in spite of all endeavours to keep them down by hoeing, and after a heavy expense had been so incurred, all hope was abandoned, and the lambs were put on to eat autumn-planted cabbages, spring-sown thousand heads, and weeds together, in the hope that the land might afterwards be got fit to grow barley.

"To go back now to your question as to the effect of the severe winter upon live stock: Cattle had to subsist almost entirely on dry food during the winter, and for a month longer than usual, consequently the great crop of hay of 1878 was nearly exhausted. Sheep eating frozen roots made little progress, even with a liberal allowance of cake, corn and chaff; and, even where the roots—swedes and mangolds—had been stored, the severity of the weather prevented sheep thriving as usual, and the 'tegs,' when sold out in the spring, did not come up to the weight of former years. In the breeding flock the losses of ewes were considerable, especially where they had been kept mainly upon dry food. This was apparently owing to crushing each other at the troughs, so that they produced dead lambs, themselves dying afterwards. Those farmers who suffered from this cause will probably take care to guard against it in future by using racks instead of troughs, so constructed as to prevent such crushing.

The Spring Season.—"Returning to the second season, more disastrous in its effects than the frost of winter, let me show how where cabbages did and did not succeed, the mangold crop was a success. Two fields, each 17 acres, were treated differently. One had been heavily manured and steam-ploughed after harvest, and so left until the last week of March, then simply stirred by a chisel-tined drag, harrowed, rolled down, and drilled. Here, although some annual weeds appeared, there were not more than could be got under in spite of weather. On the other field about 15 tons per acre of mangolds had been carted on the stubble in the previous autumn to be consumed by sheep with cake and corn, to assist in the preparation for the next mangold crop; 30 loads per acre of burnt soil from sheep sheds and yards were ploughed in at the end of March. The land worked down fine and firm, and was planted with mangolds on the 1st and 2nd of April, a mixture of 4 cwt. fish guano and 2 cwt. Peruvian guano per acre being harrowed in on both fields. There was this difference in the result: the mangolds came up equally well on both fields; on the former they were not seriously affected by surface-weeds; on the latter they were so overgrown by them that there was no alternative but to scuffle them up, which was done by steam, working 'Coleman's Cultivator' in the second week of May, and mangolds with a few swedes were drilled again. Another crop of weeds came up with the mangolds, but this time the one grew as fast as the other, and in spite of rain the latter gained possession of the land. This detail is given to show the importance of autumn cultivation for this crop. It would appear that the seeds of annual weeds upon the field so treated vegetated in part, and were destroyed by frost and subsequent scarifying and harrowing at the time of sowing, while upon the unploughed field they were dormant until exposed to atmospheric influence by cultivation, and so weeds and mangold seed vegetated together. The result has been that with more liberal treatment and the expense of second planting on this field, the crop has been 8 tons less per acre than on that which was got ready in the autumn.

"So much for the effects of the wet season upon cabbages and mangolds. It also delayed the preparation of the land for swedes and turnips, and the sowing was late. On land adapted to these crops barley and wheat generally looked moderately well, though wanting sunshine; the clover and rye-grass abundant.

"But it is upon the heavy lands that the effect of the continued rains has been most disastrous. Previous wet seasons made the effectual fallowing of such land after vetches or mixed seeds, eaten off early, impossible. Dead fallows are well nigh exploded, and would have been worse to clean in such seasons than the attempted midsummer fallows. This kind of land has consequently for the last five years been getting fouler, and the manure is washed out of it, so even with a favourable spring, an average wheat crop could not have been expected; but now it seemed hopeless: the wheat and barley upon clay and marl generally looking very badly. At the same time it must be added that the timely application of top-dressings to the growing crops upon such land has this season had a wonderful effect in enabling them to withstand the effect of constant saturation; and where this has been done there will be an abundance of straw. What the product of corn may be it is yet (July 1879) too soon to calculate upon, but with straw enough there is hope. Unfortunately previous bad seasons and present low prices have discouraged expenditure in this direction.

"The clover crops on the strong lands are good. Hay will be fully an average, though damaged to some extent by floods. We only want the predicted drought to secure these crops and clean the fallows, and the prospects would brighten wonderfully.

"The *winter's* lessons are: (1) To guard against the effects of severe frost, wheat on clay land should be sown between the middle of September and the middle of October, after clover and beans, the land plonghed once, quantity of seed used during that time not to exceed five pecks per acre; and it should not be planted upon land fallowed after vetches, or any other fallow, which should be left for barley. This will not apply to very poor clays or to strong marl upon clay subsoil, the most difficult of all land to deal with. (2) To manure and plough before winter all land intended for mangolds. (3) To secure from frost all root crops as soon as possible after they have done growing. This is no new lesson, but it has been enforced by the late winter. (4) While giving to breeding ewes dry food—chaff, malt dust, maize, and decorticated cotton-cake is not an expensive mixture—to take care that they do not crush each other to get to it. (5) If growing cabbages, to bear in mind that high condition and good cultivation will afford the best security against a severe winter.

"The wet *spring* teaches us: (1) How utterly helpless we are in dealing with foul clay land in such weather, and how important it is, when we have such land clean, to keep it so by forking after harvest. (2) That high condition—whether it be the result of previous manuring by sheep eating green crops, with the addition of cake and corn, or of farmyard-manure, or the early application to the growing crops of guano, fish guano, or nitrate of soda—has a great effect in enabling these crops to withstand the ill effects of continued rains. And lastly (3) That even in such seasons, relying upon our own exertions and the promise that 'seedtime and harvest shall not fail,' we must determine to produce all we can, especially of such things as are least abundantly imported—mutton and malting barley to wit—and hope that with more favourable seasons, and an improvement in the general trade of the country, we shall as heretofore get over all our difficulties."

Thus far was written before harvest time last year. The paper was sent back to Mr. Randell for any addition which the subsequent experience might suggest, and we now add the following additional report:—

"All went from bad to worse. The rain continued, unrelieved by sunshine; hay in many places was carried away by flood, and the quality of that which escaped was materially injured; even with better weather it would not have been good, as, like everything else, it had wanted warmth and sunshine. The barley-crops went down, and before harvest had a second growth from the roots in ear. So, with a great bulk of straw, there is nearly 3 quarters of barley per acre less than in 1878, inferior in quality, and damaged after cutting by contin rains. Wheat is 25 per cent. less than the average of the thirty years, and of indifferent quality. Beans are a failure, peas planted after them are only half a crop.

"Enough of complaining; there is a somewhat brighter to the picture, and it must be shown.

"1. The one field of mangolds produced 40 tons per acre, other, of mangolds and swedes mixed, 32 tons per acre.

"2. It has been said that the field of cabbages—16 acre was sold at a high price; it may be added that after cabb the same field produced 8 acres of cauliflowers, 5 acres of bages again, and 3 acres of cabbage-plants; all of which were sold at satisfactory prices; leading, with other consid tions, to this conclusion—that where soil and situation en us to do so with advantage, the old routine or course of c ping should be given up, growing instead anything that pay. On this farm the production of vegetables and fruit been increasing. Some ten years since, 80 acres of land added to it, of which 25 acres were in tillage. Twenty a were at once planted with fruit-trees, apples, and plums, and whole 25 acres laid down to grass. Pasture and trees are d well, thanks to folding twice a year by sheep eating oil-c corn, and roots. Five acres of poor clay-land have been g up this winter to plum-trees and black currants. The upon which the early cabbages were grown last year will be sown with peas of one of the most popular kinds, with a to selling green if a satisfactory price can be obtained; if they will be harvested, in the hope of finding purchasers year at one-half the price (32*s.* per bushel) now paid for seed. With regard to the arable land generally, it se desirable upon this farm to ignore all system, using the s portion of light land mainly for the growth of vegetables seeds to sell, and roots for sheep, with occasional crops of c making the best clays grow corn more frequently, and lea the worst two years in grass instead of one.

"And, to complete this brighter side of the picture, sheep are sound. They have been, as usual, between hurdle the year, having an allowance of dry food, with access a times to salt. That this is a preventive to the rot would ap from the following instance of immunity from it on very gerous land. In September last, when culling out the breed ewes intended for sale, twelve were found which, for var reasons, were unfit to breed from, with a view to asce whether with dry food—clover-chaff, oil-cake, and maize, salt—they would take the rot upon land where, without food, they certainly would not escape it. They were at once into a meadow, more than half of which had repeatedly been flooded by the Avon: they remained there until the middle of November, were then put to roots, sold in January at 74*s.* 9*d.* each, and proved when killed to be perfectly sound. It must not be supposed that because dry food and salt saved these sheep, where upon the grass alone they would certainly have become rotten, that such food is to be relied upon with entire confidence if sheep are allowed to go upon meadows which have been entirely under water—in this case half of the meadow had been free from floods. It only goes to prove that such treatment will prevent the disease upon any land where men of common prudence would usually allow sheep to graze, but where in 1879 they became rotten. No grass-land in the Midland Counties was safe.

"Enough has been said of the farming here; there are neighbouring farms of lighter land in good condition, the occupiers of which I doubt not can show more satisfactory results. They have escaped serious loss; but profits of farming in 1879 we do not hear of; throughout the whole of this district the reverse is very generally unquestionable and to very serious amounts. The deficiency in the harvest would vary from 20 per cent. upon the best lands to 50 per cent. upon clay-lands, which, from previous unfavourable seasons and other causes, were in bad condition. Roots were generally less than half a crop, and the preparation for another wheat-crop was deplorable. While on the grass-lands hay was injured, feeding-cattle, unless aided by oil-cake, did not get fat. Dairy-cows milked badly and became very poor, young stock did not grow, and, to crown this list of disasters, sheep are rotten to a fearful extent. The only redeeming feature in the weather of 1879 was the dry autumn, which rendered it possible to sow more land with wheat than there had before been any hope of doing; but the prospect of the condition of the land when the wheat comes off is not cheering. Taken altogether, the season of 1879 was by far the worst of the last half-century."

Mr. Charles Whitehead's land lies on the other side of the island. Kent is dryer, whether in wet seasons or in dry, than Worcestershire. The district, too, from which Mr. Whitehead writes is one of freer soil than that of Chadbury. It will be seen, however, that the difficulties of the season have been as great in the one county as the other. Mr. Whitehead says:—

"With regard to the question submitted to me as to the effect of the severe winter and very wet spring and summer of this year upon agriculture in this district, west of Maidstone, in Mid Kent—(1) As to the health of the live-stock of the farm, I consider that all the animals have been quite in an average state of health. There has been no epidemic disease. The drop of lambs was not quite up to the average in point of numbers, but they have been healthy for the most part, and the losses among the ewes were below the average. Horses have not suffered in any particular respect. Cattle did not thrive so well in the meadows as usual, because the grass was always wet and 'lush;' but their health has been generally good.

"(2) As to the crops of the farm—Wheat generally went in badly; much of it was put in late, and in many cases the plant was not above the ground until after the winter frosts. During the early spring the plant was somewhat thin, but filled up considerably during April, especially upon the best soils, and where top-dressings were applied. The wet season in May and June caused a strong growth of straw and flag, and at the same time a great unevenness. Fine weather towards the end of July, just about the time of the blossoming, improved the appearance of the wheat plants most marvellously, and except that the soft grains looked somewhat pinched, there seemed no reason why there should not have been an average yield if the weather continued fine throughout August. On my own farm I could not get the wheat in on a certain piece of land until the 9th of March. Having seed by me of Scholey's Square Head which had been steeped in sulphate of copper for sowing in November, I sowed this, and was in fear until the change in the weather arrived that it would not come into ear at all. After a few fine days the ears appeared, and at the beginning of August there was a promise of an over average yield, and the plants were particularly even and uniform. This wheat was cut about the middle of September, and in spite of the continual rains during the latter part of August and the beginning of September stood almost upright and yielded 6 quarters of corn and a large amount of stiff straw. The quality of the grain when the wheat was cut was good for the season; but it was very much injured by rain when in the shock. This variety of wheat was the least affected by the wet season; and in most cases its straw did not go down, at least not so badly as that of other varieties. With regard to the influence of previous cultivation upon the wheat plant, that after fallow was perhaps the best. Slugs were troublesome to some of the wheat plants upon clover leys, and caused a certain loss of plant. The best and strongest piece of wheat I had, which was almost in a normal state during its growth, in spite of the adverse climatic influences, was after white tankard turnips folded in August, after rape sown in the preceding autumn and folded in March. This was put in on the 13th of October, 1½ bushel of Scholey's Square Head being drilled in per acre. The effect of the winter upon clover was not prejudicial, as there were heavy cuts as a rule about here. Winter tares suffered considerably. Trifolium was not injured. Winter oats were not affected in any way, and their yield was above an average. Winter beans are not grown. Spring oats went in fairly well and in pretty good time. There was a spell of comparatively fine weather early in March, which enabled farmers to put their Lent corn in. On most of the farms in this locality the oats did fairly well, and gave about an average crop. Barley is not grown. Spring beans had plenty of haulm, but were not well podded, and were much blighted. The very wet weather in the spring sadly interfered with the usual cultivation of land in preparation for mangolds, swedes, and turnips. Mangolds were got in in a most unsatisfactory manner, and the weeds were fast overpowering them, when fortunately a spell of finer weather came; but the crop has been much under average. The attempt to get swedes in was abandoned by many, and the land lay soddened with moisture, growing thistles, couch, and water-grass abundantly. Great efforts were made to get the land cleaner, and turnips were sown in some instances, but there must be a great crop of weeds with the coming corn crop when the usual rotation has been continued.

"As the land in this district is for the most part naturally drained, as it lies upon the Kentish ragstone, and is friable, a wet season is not so disastrous as in the heavy clay-land district of the Weald of Kent, which is closely contiguous to it.

"It may be remarked that the wet, cold, and changeable weather in the spring at the time of the blossoming of the fruit-trees so affected the 'setting' of blossoms, which were unusually abundant, that there was not half a crop of fruit in this, the 'garden of England.' At the same time the hop-plants were seriously weakened, so that they could not grow away from the aphides, which caused one of the most general blights on record."

A report which Mr. Lawes, of Rothamsted, was good enough to send me would have been presented here, but the reader will, I believe, find that the Rothamsted experience is the subject of an independent paper in this number of the 'Journal.' I proceed now, therefore, to quote the reports to which I referred in the outset as gathered from my other correspondents. The first two are from northern counties.

CAITHNESS.—*Watten.*

1st. As to deterioration and loss, amongst the hill farms. Cheviot sheep occupy most of the hill farms in the northern counties, Black-faces being present only in few instances; and the death-rate of the latter has been much the greater of the two in the same circumstances. Half-bred and Cheviot ewe-flocks, from which are bred the half-bred stock, being crossed by Leicester tups, occupy the lowlands and arable ground, and are chiefly confined to Caithness. All stock-owners have lost above an average, but no season has shown greater divergences from usual averages. For instance, the west coast of Sutherland has got off comparatively safely in comparison with the middle district, removed alike from sea and rail. The latter suffered, owing to the impossibility of bringing extra keep to the hirsels, or the hirsels to where it could be provided. The east coast comes next, where the long-continued north and east winds during spring put a finish upon the damage caused by the severity of the winter, reducing the stock the third time, by the blighting of vegetation almost to starvation-point, and causing a deal of loss amongst lambing ewes. The loss amongst the old sheep has run from 7½ per cent., under the most favourable circumstances, to 20 per cent., or even more in the worst cases. We may therefore conclude that about 12 per cent. may possibly be regarded as a fair average. Lambs again will run from two-thirds in the west and most favoured places, to one-fourth or less in many instances of the annual average; and they are all bad alike and of little value.

In instances known to me, tenants instead of selling cast ewes have had to buy to make up stock. In others, after spending hundreds of pounds in extra keep, the shott lambs have been simply useless and worthless. In fact, a produce of one-half is counted something out of the common in the middle and east coast districts. Few old sheep, where hand-fed, died before the 1st of April, and with good weather they might have struggled through; but April and May killed them in myriads, there being little or no grass, and the sheep having been all to a great extent removed to their summer quarters, owing to a delusive fresh and warmth setting in about that time, which was followed by a period of the most bitter cold weather we have ever experienced. The truth of the matter is—most stockowners lost heart and just left them to Providence, as they could do no more for them except taking them down to be hand-fed again. This they were pretty sick of, and always were in the hope of things getting better, so lost thereby all their extra keep and sheep likewise. In Ross and Inverness the storms of winter did not do much harm; but the spring destroyed numbers, and the losses are not much less than those of Sutherland, only flockmasters there mostly saved the great expense of extra feeding. Extra feeding on farms which fed straight through would amount to from 5*s.* to 16*s.* each sheep. In addition to direct costs and losses, flocks have deteriorated. Lambs are very bad, owing to the poverty of the ewes when with young, the food not being sufficient to sustain life and fully to develop the fœtus; and when the young were dropped, the supply of milk, for the same reason, was scanty, so the lambs are badly thriven, scraggy and pot-bellied. The ewes, instead of producing milk when a flush of keep was to be had, laid it on as fat, so in many instances they got in fair order, and no doubt will get over the great privation they underwent. Counting the fall in value of stock, and the low state of the wool-market, many large holders have lost a fortune, and that not a small one. Yet all these experiences are not without a lesson, and I will, in conclusion, point out a few things that in my judgment have intensified this state of matters. In the first place, owing to many previous seasons being open and mild, flockmasters never provided any keep for such emergencies as storms; and instead of cutting the haughs and other places where good meadow hay might be made, they pastured them; the high prices of stock and wool inducing them to increase the number of the stock to more than the ground could carry. As a result of this procedure, the one-year-old sheep, or hoggs, have been wintered in the low country (arable ground in Ross-shire and Caithness) upon turnip, and this has at length rendered the stock much more delicate. In fact it is only in some farms we meet with stock which are considered as hardy and sound as were the characteristics of the Sutherland Cheviots in days gone by. The ewe-lambs have been also generally wintered upon turnips, and they are tupped by sheep in many instances pampered to such an extent as render them unfit for hill service. Let me add, as suggestions, that if lime could be brought into the country the benefits would be untold; and if farms could be split up and rendered more manageable; and if stockowners depended less upon their shepherds' reports and looked more after their own affairs; and if —, &c.

2nd. OF TILLAGE OPERATIONS. (*a.*) *As to Root Crops.*—Our spring months, although cold, were as a rule dry, so we were enabled to get our turnip crops, with but few interruptions, put down in good order, thus securing a fair promise of a sufficient braird. But although this proved to be the case upon properly cultivated and highly manured soils, on much of the inferior lands where drainage has been at a discount, a great breadth had to be re-sown, owing to the cold weather and blighting east winds; and where plants made an appearance, they soon assumed a most unhealthy appearance, and to a great extent withered away. The saturated soil increasing by its coldness the effect of ungenial weather, rendered the manure applied ineffective, and so the plants were destroyed by the depredations of insects when tender. Upon this farm, which has within its bounds some of the best soil in the county, 80 acres were all singled in good season. This was upon the better part of fallow, but there was a field resting upon a retentive subsoil which had to be in parts redrained, and in autumn, thinking that the breaking up of the subsoil, owing to the early harvest, might be done with the usual strength of the farm, I set to work with subsoil-ploughs and thoroughly stirred the soil to a depth of from 14 to 18 inches, and have thereby secured a fair crop on the greater part of it. The failure occurs where the soil rests upon a subsoil of blue clay, which is impervious to water, and where by way of experiment half a ton of the much-vaunted ground coprolites were tried instead of the usual dose of guano, dissolved bones and bone-meal. I suspect that the kind of artificial manure applied has more to do with the success or non-success of our turnip-crop than farmers seem to think, as, on inquiry, I find where superphosphates alone have been applied that the crop is generally a failure, owing, I suppose, to this manure being too soluble in a wet season, and lacking the ammonia so necessary to push vegetation ahead in a cold one. The rain would be apt to wash a great portion out of the soil, and, where drainage is deficient, the food of the plant would be presented in too diluted a form. True, the soil by its absorptive properties would retain the manure, but I suspect seasons such as we have passed through have not been taken into consideration by the analyst. About the beginning of July much rain fell, and fears were entertained that upon even the best soil the crop would be ruined; but this was obviated in a great measure, I believe, by our starting (when favoured by the intermission of a day's drought) three scuffles with grubber-teeth, which stirred the soil to a depth of about 10 inches, thereby admitting fresh air and helping to carry off part of the superfluous water which might fall afterwards, and would otherwise be retained by the caked condition of the surface-soil. This was done upon two different occasions all over the break, and the result has been a crop above an average. A neighbour of mine, at my suggestion, adopted the same practice, and has likewise secured a better crop than he has had for years.

(*b.*) *As to Corn Crops.*—They were all got down in good order, and, as a result, we had a regular braird with strong and healthy plants, which did not, however, make rapid progress, owing to the saturated condition of the soil and absence of heat. Afterwards upon dry free soils the constant dropping nature of the season made the crop run to straw. This also was true of land after root-crops; and in consequence a great breadth became lodged before the ear was fertilised; and even in the lighter crops the upper portion of the head was nothing but chaff. Cutting operations commenced about the first week of October, and upon this farm they proved to be most tedious work, owing to the twisted and laid condition of the crop, and the great bulk of straw. Upon one field of 20 acres the machines were entirely useless; I therefore put on ten scythes. You may judge the nature of the work when I inform you that with the utmost diligence a man could not get over above half an acre a day; sometimes even less. When looking at the work being done—much of the straw useless and the corn rotten, and neither food for man nor beast—I felt that high farming might be carried too far. No less than 200 quarters of oats have been sold off this particular field upon a former occasion. This year the yield will not be 90 quarters. After much hand-labour the machines were driven through the remainder, the work not being at all satisfactorily done; but time would not permit of delay. Before cutting was finished, on a fine breezy afternoon, the corn being in excellent order, all hands were set to "screw," that is to put the corn together in small stacks upon the field. The hands are divided into parties of four each, and each party take three rows of stooks; one man, laying a foundation of about six feet in diameter, builds the rows as in ordinary stacking, the heads being drawn gradually in towards the summit—two loops of straw rope are laid across the top and tied down the side; another man forks the corn, and the remaining two drag in the sheaves to them by grasping eight sheaves at a time. We finished 33 acres in this manner in five hours. Next day proved wet, and cutting was resumed, but in the afternoon we got 40 acres put together; and again on the Monday we got other 30 finished in four hours, which made the half of the crop secure, as by this plan the crop is comparatively safe. We should, however, prefer carting direct from the stook, as we thereby save the loss by, the handling and shaking, and also much labour. Still in our climate but for this method in a late season we should oftentimes lose the half of our crops.

George Brown, Jun.

Berwickshire.—*Mungo's Walls, Dunse.*

1st. *As to the Live-stock of the Farm.*—Horses, having had plenty of idle time during seven months, are healthy and fresh. Feeding-cattle, having plenty of litter and shelter, did well where turnips had been harvested. Those that had to get frozen or muddy turnips all through, may, however, have left more pay, simply by surviving until prices rose in May! There is more sometimes made in buying and selling, than by feeding nostrums. Cows got less outdoor exercise than usual, but in other respects were well cared-for. On grass, however, they made little butter, although brought in to sheltered yards and straw every night. Grazing-cattle turned out fresh, lost flesh during the summer, and leaner purchases made little advance. Sheep suffered most severely during winter, many being mere "objects" at the end of it, although getting liberal fare. Our ewes got the best of turnips, free from frost, and hay every day, and came to the yeaning in good condition apparently, bringing forth a good fall of firm and strong lambs; and then all went wrong! First, many ewes showed they had got a taint on the wet pastures of November; a good many of them died, and the rest were pretty well recovered by cake and corn, which they should have had sooner, had we known. Heavy snow-storms and slush continuing all March, the young things were too much confined, and to that we must attribute the invasion of a most fatal disease, previously unknown to most shepherds, but very general this year, among what we call "bred" lambs, and said to have appeared in one or two places some years ago under the name of "blackleg." At two or three days old there appear livid swellings on *any* part of the body, from tip of nose to root of tail, and death comes in a day or two—*no* recovery. We thus lost more than a third of our lambs, and generally the best. When a week old they were safe from the blackleg, but then came the old familiar "cripples" to swell the list of casualties, and the unprecedented result is that we have but eighteen lambs (many of them miserable things) from each score (twenty) of ewes put to the tup. The worst crop we ever before had was twenty-four, and a fair average we reckon at twenty-eight, weaned, from "Border" Leicester Ewes (bred from Messrs. Stone and Burgess of Leicestershire). Of course, hardier crosses from the Cheviot have, in this low country, done much better, though they have not been altogether scatheless. At the autumn lamb sales it was observed that well-known flocks presented little more than half their usual number of "tops," and these not up to the mark. Thus, the tremendous fall in wool and the drop in mutton, together with the uncertainty of the turnip-crop, have combined to keep the price of lamb rather below last year, quality considered. Talking of wool, ours is good, scarcely a cotted fleece among the ewes. But can any one explain this cotting, or, as we (perhaps more significantly) call it, "coating" of fleeces? It is not always the leanest ewe that is worst.

2nd. *As to Field-work.*—Of winter wheat I can say nothing. My own was sown on March 3rd, each of the 7 acres receiving 4 bushels Square-Headed seed, with 1¼ cwt. fish-guano, and bone-meal afterwards. It came thin and spindly, though afterwards dark enough in flag. In 1877 the same sort, sown a month earlier, was cut on October 8th, but this was a later season still, certainly the latest of modern times, and we did not cut till October 15th. Last year, and two years ago, we learned most emphatically that a very big crop may yield very poorly. As to the turnip-crop, some of us had enough of swedes stored to serve a month or two, but more were surprised by the early winter, and had to dig laboriously among snow for daily supplies. Taking advantage of occasional thaws, we managed to supplement our store with roots fresh enough for immediate use, though not so clean as could have been wished; and any poaching of the land was remedied by the frosts of March. It was well for us that we managed thus to save part of our original store until April; for the very considerable breadth that remained on the ground was never fit to keep in store above a week, getting steadily worse as they stood, until at last quite one-half of the remainder were no better than soap, and cattle had even to *sup* portions of the latter half, and did tolerably well too. Among all this wreck, however, there was a brilliant exception in a somewhat old-fashioned purple-topped swede, deep-growing and round—none of your "big croppers," which are soft as butter—and you may guess I sow no other until better advised. As to fallow operations, it is perhaps owing to our late climate that autumn cultivation is seldom now attempted, and never with satisfactory results, the land so treated being no cleaner in spring, and much wetter than if it had lain in plough-furrow.

There can be no question as to the good of land drainage, if properly planned; but two days ago I had water standing between Government 4-feet drains at 28 feet intervals; while heavier land, where we more recently put in a 30-inch drain in these intervals, was drying fairly and regularly. After twenty-five years' observation, I am all for shallow drains, and plenty of them, on anything like heavy land.

On some light lands most of the roots got sown in May, the weather being remarkably favourable at first, although showery towards the end of the month. After that we had *ten* inches of rain in two months; and, not to mention minor delays, were unable to get horses on the land for a whole fortnight together.

Our swedes were well planted, not all thinned though, nor could we get them cleaned. Softer turnips, being swept off by flea, were very late and blanky; and for the first time in my life I had to sow turnips in July. In fine, you cannot find any one that ever saw so bad a season for the proper fallowing of heavy land.

The lesson to be drawn from all this, and pondered during the remaining years of current leases and lifetimes, is that land was taken five or ten years ago at much too high rents, which few landlords will abate—and that on high principle!

JAMES THOMSON.

No one, I am sure, will regret that he has been taken by the above reports outside the limits of what may be considered the strict field of the Society's operations. Scottish experience has many good lessons for English agriculturists; and the letters of Mr. George Brown, jun., of Caithness, and Mr. James Thomson of Berwickshire, will be read with interest not only in the upland cultivated districts of many northern English counties wherever circumstances resemble theirs, but wherever lessons in energetic harvest-work, liberal winter management of stock, and choice of hardy breeds and sorts, whether of plants or animals, are needed; as indeed they have been needed everywhere in the United Kingdom during the past two years.

The following are some of the letters of my English correspondents:—

NORTHUMBERLAND.—*Houndalee, Acklington.*

1. *Live-stock.*—With the exception of calves, my stock could not possibly have been healthier than they were during the winter and spring of 1879. I keep a flying stock of half-bred Leicester and Cheviot ewes, and although they lost a good deal of condition during the very severe weather, yet at lambing-time they did well, having a fair average crop of healthy lambs and plenty of milk. Their feed through the storm was bean-straw, and chaff as made by the thresher—not chopped—and one truss of hay to about sixty ewes, with a half-pint of oats apiece twice a-day. About a month before lambing I give turnips, about as many as they can eat, and continue them as long as I can. The hoggs get much the same feed as ewes, only not exceeding one half-pint of oats per day, and no turnips. Of course they are not intended to get fat before September; but had it been a decent season since May, most of them would have been fat by July. I bring up all my own cattle, rearing about fifty calves a year, taking care to buy only well-bred ones, which at present are very dear, from 50s. to 60s. each. I never knew so much sickness as there has been among young calves since last autumn. I mean calves from birth to about six weeks old. It must have been caused by the severe weather. I have tried many remedies, but have not found any trustworthy cure. The older animals—from one to two years old—have been remarkably healthy, did well in the yards, and continued thriving in the field, although slowly, owing no doubt to the wet state of the grass and the cold weather. Horses needed a good deal of corn to keep them up to their work. The grass seemed to do them no good; and it would be impossible for them to do much work on this strong clay without a lot of dry food.

2. *Tillage operations.*—I may state that nearly the whole of my farm, with the exception of 60 or 70 acres, is the strongest possible clay, thoroughly

drained at 4 feet—although I certainly do not prefer such deep drains on strong clay—and in fair condition. Clovers did not take well in 1878; but as I only sow the best English and Welsh Red, and the best seeds of other clovers and grasses, they stood the winter well; and, although much later in spring, the hay-crop was a fair one.

Turnips and swedes left on the ground during the winter were almost a total loss. I had some hundreds of loads rotten, and a great many more just like sponges. Those "planted," *i.e.* pulled with tops and roots left on and placed close together, kept good, and made capital feed till April. We had not a particularly bad seed-time, and the land worked remarkably well.

As to fallow operations, a decent fallow was scarcely to be seen. Speaking personally, I like fallow ploughed for the first time in March and April: as a rule it works much better than that done in autumn; it does not get "soured" below, and keeps weeds back. My experience is that the autumn furrow is labour lost. This refers to bare fallow on strong land. As to draining, I quite believe that for strong land 2½ feet is plenty deep enough, and I keep the ridges in the old form, but not too high. No end of harm has been done here by draining 4 feet and laying the land flat—the water cannot get off.

The outlook for farmers is gloomy in the extreme.

J. W. ANNETT.

YORKSHIRE.—*Olliver, Richmond.*

1. *Live-stock.*—The winter and spring of 1879 bore hard on the flock-master. With due care and liberal feeding, doubtless many flocks have come through the ordeal without serious loss; but in order to this a large expenditure on extraneous food has been incurred. On the Earl of Zetland's farms here, managed under my supervision, about 440 ewes are annually put to the ram; one-half (being Black-faced Moor-ewes) are kept on a small moor on the outside of the estate, at an elevation of 1000 feet above sea-level. The others (Shropshires) are kept on the home farm, at an elevation of 550 feet. The keep of the Moor-ewes, in ordinary seasons, has been an allowance of hay, during such periods of the winter, averaging about one month, as the grass and heather have been covered with snow. This, with what they could pick up, had hitherto brought them very well through the winter. Last season they were hay-fed from the middle of December to the end of April, at a cost over ordinary seasons of not less than 6*s.* per head; and even with this many of the ewes clipped very poor. The mortality in lambing, however, was not above 1 per cent. greater than the average of ten years previous, and the loss of lambs not quite 4 per cent. greater; and these were principally from the shearling ewes.

The Shropshire flock during the winter months is run over 250 acres of old pasture-land, getting a few turnips thrown down daily after the end of November, supplemented with a little cake and corn about a month before lambing. When the ground was covered with snow they had a mixture of pulped roots and straw-chaff daily, with 1 lb. of cake each—as much of the roots and straw as they could eat. Under this treatment the flock has done well, rarely losing as many ewes as 3 per cent. per annum, and frequently not so many as 2 per cent. During the last winter and spring they were trough-fed for four months, at an expense over ordinary seasons of at least 10*s.* per head. The deaths from October, when put to ram, to July 31, were twelve, an increase of nearly 3½ per cent. over the average of years. On the 31st July we had fourteen lambs fewer than the previous year, which was an average one. On the whole, the loss sustained by deaths, smaller increase and extra-keep, cannot have been less than 200*l.* Some of our neighbours who had fed as liberally experienced about the same results. Others who did not do so sustained much heavier losses both of ewes and lambs, and financially a very much greater loss. Our greatest loss was from the shearling ewes and their produce, they being very poor, and their lambs so small and weak that many succumbed to the rigours of the season. This shows they were not sufficiently maintained, and it would doubtless have been better management to have separated them from the ewes and kept them by themselves.

2. *Tillage operations.*—The wheat-crops stood the winter remarkably well, the only failures being on wet undrained land. Spring corn was very late sown, but in this district, on the whole, it went in well, and though quite three weeks late at harvest time, yet on all good sound and well-conditioned lands there was ample bulk for a good crop. The failure has been on wet, cold clays, and also on poor land even when not wet. Several fields on land of this description in this neighbourhood have been hardly worth reaping. This is attributed to the wet and cold summer more than the winter.

Root-crops exposed during winter were very much damaged; not so much from the frost, for they were well covered with snow during the time it was most intense, but from the wood-pigeons and rooks, which picked and damaged the crown of the bulb, after which it invariably rotted. The loss varied, according to circumstances, from 30 to 50 per cent. of the fields unsecured.

W. J. Moscrop.

Lincolnshire.—*Claxby, Alford.*

I have now been farming for fifty-five years, and do not remember such a remarkable year as we have had since the latter end of October 1878. Part of my occupation is dry land, part lying lower is stiff, but it, too, is good land. On the former, the wheat-seeding got finished pretty satisfactorily. As to the lower land, it was impossible to complete the wheat-seeding; and for the first time during my experience I have been beaten. On the dry land the crops were fair; but, as to the lower land, the crops were the worst I ever knew. We had continual floods of rain from the latter end of October to the beginning of December, when frost and snow set in, and continued for a long time. The frost very much benefited the land (much damaged by autumn floods), so that we got a very fair spring seed-time, and not too late. A great deal of wheat was sown in spring, on such land as could not be sown in autumn, and, with a good seed-bed, came up well. But the floods of rain, which fell almost continually up to the end of July, afterwards damaged the wheat and barley-crops at least one-half; the whole of the time since seed-time, except for very short periods, having been wet, cold, and sunless.

Turnips got fairly put in on dry land, by watching for a fine day, and came up well; but it was too wet and cold for them to grow fast. And as regards the heavy land, a very short breadth could be sown, for the land could not be got into condition.

Fallows on heavy land have been in a foul state, where too much freedom in cropping has been practised. I do not think there is so much advantage in autumn cultivation as some people say. The expense in cultivating, cleaning, picking, &c., is repaid when it happens to be an early harvest and dry autumn; but we do not get this as the rule. I think it better not to let the land get in a foul state by cross-cropping, or taking what some call more freedom in cultivation, but to farm generally on the four-course system, having one-fourth part turnips where land is suitable, one-fourth part seeds, and keeping a good flock of sheep on the farm, well fed. Autumn cultivation is not required under such a system; and running the steam-cultivator across the fallows, so soon as it is dry in the spring, will bring the work up.

J. B. Dring.

CHESHIRE.—*Brassey Green, Tarporley.*

The extraordinarily wet and cold autumn, winter and spring we experienced in 1879 has totally unfitted all wet and cold lands for cereal crops; and the farmers in Cheshire are resolving to diminish their tillage-grounds and increase their pasturage. Early potatoes withstood the wet weather better than most other green crops. Turnips and mangolds most generally proved a failure; and there were hundreds of acres prepared that could not be got upon to sow, which have proved a very serious loss. The losses in the early part of the year amongst cattle, sheep and horses were much more numerous than usual. But the greatest disaster which about one-fourth of the Cheshire dairy farmers have recently experienced was in consequence of the great depression of the cheese trade which took place at the close of the winter, or very early in the spring.

Numbers who had been offered 60*s*. and over for their dairies in the autumn, sold ultimately at 35*s*. and under; and unless in better times they had laid by in store, they cannot possibly grapple with present difficulties. As all my farm is down in grass, and nearly all drained and well-boned, I had after May a good bite of grass, though rather heavily stocked with sheep and feeding-cattle: still the cattle did not thrive so well as usual. The losses amongst sheep, chiefly through the rot, have been more numerous than usual, though not so heavy as in some other counties. Out of the grazing flock of 155 I have kept sixty-nine through a portion of the winter, and only three appeared to be affected, and two of these only in a very slight degree. The remainder I am now disposing of to a neighbouring butcher at 10*d*. per lb.; and he says they answer his purpose better than heavy weights at 9*d*. Stocks of cattle in general are very much out of condition, and an unusual number are now casting their calves, and I scarcely ever remember barren cows and stirks being so numerous. Within the last few weeks cattle for the dairy have rapidly advanced in value. No doubt the great rise which has recently taken place in the value of cheese, and prospects having thus improved, is the chief cause of this advance in the price of live-stock.

The stiffest portions of my farm, which all lies upon clay, have at times, through the heavy rain, sustained a little damage by the trampling of the cattle. I have, however, reaped the advantage of draining and having it in a good state of fertility. There is a great scarcity of grass on large tracts of clay-land, which is mostly undrained in this part of Cheshire, but a good supply on light and rich soils. The late depression should teach agriculturists to live in times of sunshine and prosperity within their means, and guard against a lavish expenditure. It should incite them to be skiful and energetic, aiming at a high state of cultivation, and, if possible, making their farms produce more than their predecessors got.

JOSEPH ASTON.

NOTTINGHAM.—*Wollaton.*

(1.) *Live-stock.*—The prolonged winter of 1878 made evident two things. If stock had sufficient care and proper food, they were healthy and did well; when neglected in these matters, they suffered considerably. Particularly was this the case with sheep, and especially ewes. On many grass-farms where the chief stock kept are dairy cows, some one, two, or threescore ewes are often wintered hardly. Among these there was generally great mortality; half, and in some cases all, the ewes died. But on farms where they had a little corn, bran and hay given to them they did well. I used hay-chaff *ad lib.*, a half-pound of decorticated cotton-cake, and half-pound malt-culms per head per day. The ewes ran on sound grass-land, and were very healthy, and forty-nine ewes produced ninety-one lambs. Good fat lambs were scarce, and sheep have not done so well as in drier seasons. I am happy to add that my ewes and hoggetts have been kept on dry grass-land, and, receiving the above liberal allowance of dry food, have kept sound. But the sheep-rot has made dreadful havoc among many flocks. I hear of one case where but twenty remain of a flock of 800. Cattle and horses have generally been healthy. Cows have milked well, but unless they had meal, or, better, decorticated cotton-cake, there was but little cream in the milk. Grass has been too washy to produce butter or beef.

(2.) *Tillage and Crops.*—Winter beans were a complete failure; many were ploughed up, and thousand-headed cabbage or other green crop planted in April; and some fields left would have been better ploughed up, for they have done no good. On most strong land wheats were too thin; November of 1878 was so wet that much of the seed rotted in the ground. Farmyard-manure, applied at seed-time, has done no good whatever to wheat; but portable manures, especially soot, have answered well. Where only dung was used for wheat or barley on the cold clays the crop was a failure—acres did not yield the seed again, though the land had been drained, and each drain could be accurately traced by the extra height of the grain growing just over it. On wheat-land, after beans, clover or vetches, slugs have been dreadfully abundant, and have done much damage in the spring. For me they cleared off 18 acres of young clover. I sowed in early mornings and late evenings 4 bushels of hot lime per acre, and then re-sowed clover, and thus secured a plant. I would advise the sowing of 3 or 4 cwt. of salt per acre, especially after clover, peas, beans or vetches.

As to autumn cultivation:—As a preparation for root-crops, it is my opinion that on strong land it is indispensable. We cannot depend upon having a plant of mangolds unless the seed is sown on the frost furrow. Our best plan is to cultivate (generally by steam) as soon as the harvest is finished: work out and clear off the weeds, getting the land ploughed—manuring first, if we can—but getting it ploughed before winter. Then, when it gets dry in the spring, apply broadcast the portable manure, working it well with drag and harrows, and drill on the flat, not too deep. By using these means we had a good plant; but more sun was wanted for rapid growth.

Of all farming operations here summer fallows were the worst. We could not let them alone; the weeds would go to seed; yet all work was wasted time. They were ploughed two or three times, but this has not done a scrap of good, for they were just as foul in August as at Christmas time. For many a summer fallow there must be paid three years' rent, rates and labour bill, before there is any return.

W. P. J. ALLSEBROOK.

DERBYSHIRE.—*Ashbourne.*

The winter of 1878–9 was exceptionally severe in the Peak of Derbyshire. The land was frost-bound, and the snow lay on it for many months; and it was followed by a spring that was one only in name. Hence it followed that the large forage crops of '78 were in the great bulk of cases entirely consumed, and in many instances had to be supplemented by various kinds of feeding-stuffs, causing thereby a large and unexpected outlay, for which the prevailing low prices of farm-produce offered no corresponding return.

The live-stock of the farm, as a rule, were very healthy through the winter, as they usually are in hard weather if only they are well attended to; but when spring-time came round they seemed to relax in condition, becoming soft and flaccid. This led in many instances to in-calf cows casting their calves too early, and ewes their lambs. In the lambing season the weather varied rapidly and frequently between extremes of hot and cold, causing much fatality among ewes. Parturient fever was rife, and many ewes in good condition, so far as quantity of flesh goes, sickened and died very suddenly, when the weather became suddenly warm after a spell of cold. It is probable that sheep were not so easily and quickly infected with liver-rot in the winter of 1878–9 as they were in the following summer and autumn. It is to the astonishing spring and summer seasons of 1879 that we must attribute the disastrous malady from which sheep in many districts have been suffering. On the carboniferous limestone hills of Derbyshire, however, there are but isolated cases of rot, except among such sheep as were laid out to winter in other districts; these are now failing with rot, and it is to be feared they will communicate it to the sound portions of the flocks to which they belong. In the Ashbourne district great numbers of sheep are dying, and many others are doomed, while even cattle are succumbing to the same parasitic disease. One limestone-land farmer of my acquaintance, who last autumn sent out fifty hoggetts to be wintered on a low-lying farm on another geological formation, has already lost more than half of them, and expects the remainder will die; and his experience is that of one among scores. The present state of things means wholesale ruin to many farmers.

J. P. SHELDON.

DERBYSHIRE.—*Hartington.*

1. *Live-stock.*—We have generally found after a severe winter that sheep, if they have had plenty of suitable food, have been strong and healthy, and have brought a good crop of lambs. During the winter of 1878–9 the sheep were kept well, but at the lambing season, the beginning of April (though we had lost none of any consequence), they were exceedingly poor, and short of milk. I do not know how to account for their being so poor, unless it was the unusual severity of the winter. The fall of lambs was under the average both in numbers and quality. Among some of my neighbours the loss from scour and weakness has been very great. The ewes were generally as strong and healthy as could be expected, considering the lateness and wetness of the spring and the scarcity of food. Many, within a few miles round, were starved to death through the excessive wet and cold after they were shorn.

I am not aware that the prolonged winter and the wet spring have had any specially injurious effect upon the health of the horses and cattle. They have had none in my own case, and I have heard no special complaints from my neighbours. We have to be thankful that in this neighbourhood the flocks have escaped the liver-rot which has caused such ravages elsewhere.

2. *Tillage and Crops.*—Oats are the only cereal grown about here; and these turned out better than was for a long time expected. The first sown, about the beginning of April, especially on the leys—land that has for several years been laid down to grass—came up very poor and thin; those which were sown about three weeks after came up better. For a long time we expected to have to cut them green, but those who waited had the satisfaction to find them get fairly ripe; and the latest corn turned out best, for the weather was fine from the middle of October till towards the end of November, thereby giving us a chance of getting the corn in.

The crops of grass were fair, but hay-harvest will not soon be forgotten. With some farmers it extended from the middle of July to about the end of October. Whoever has experienced one hay-harvest like that of 1879, will never wish to experience another similar to it. A deal of the hay is worse than straw. Even hay that seemed to be got in well, has very little "nature' in it, and does the cattle scarcely any good.

The turnips, what few were sown early, had for the most part to be sow over again; but those which had not to be sown over again, were by far better crop than the late sown ones, for the late sown ones could not grow o account of the wet and cold. In the worst season previous to 1879, w always managed to secure enough of turnips to give to the sheep while the were lambing, but this season we have failed to do even that.

As to my own experience in general, during the year 1879, I never knew anything like it. We foddered the cows with hay till either the 5th or 6t of June, and then we began again to fodder them with hay in August, fo they had trodden the pasture into a mire. During the latter half of May and the former half of June, they gave little more than half their usual quantity of milk, and throughout the season the yield of milk fell muc short of the average.

What with high rents, high rates, high wages, and disastrous seasons, o the one hand, and the low prices of everything but beef and mutton, of whic we have not now much to sell, on the other, I never knew the farmers of thi county so thoroughly pinched as they are now. For the first time since have been a farmer they are beginning to talk of throwing up their farms But if they did, such is the insane competition for land in this part, the farm would at present be eagerly taken up; if not by *bonâ fide* farmers, by tradesmen who have saved a bit of money.

JOHN NADEN.

STAFFORDSHIRE.—*Croxden Abbey, Uttoxeter.*

1. *Live-stock.*—My small flock of eighty Shropshires were wintered grass-land, and supplied during the hard weather, and afterwards through th lambing season, with plenty of good hay in racks and ½ lb. of decorticated cotton-cake each daily. Few roots were given until after lambing. The ewes wintered well, and the total loss of ewes was three, two of which had three dead lambs each. The fall of lambs was large, and although the l during the season was, in consequence of inclement weather, greater than usual, the number of lambs weaned considerably exceeded one and a half per ewe. Over thirty ewe-hoggetts also reared one lamb each. In consequence of the scarcity of spring food, extra food had to be given to the ewes until the middle of May; and even with this expensive extra keep, the constant rain and cold winds retarded the growth of the lambs. The yearling wether-hoggetts, which I generally fatten at thirteen to fifteen months old, throve well during the hard weather on sound sheltered meadows, having a few roots fresh from the pit, with hay and mixed cake and corn, 1 lb. each, daily. One hundred were wintered and have been all, except fifteen, sold fat, the lowest price being 55*s*. each out of the wool.

Rather less than usual of foot-rot, a very troublesome complaint in this land, has affected my sheep. Except for the greater cost than usual of cake and corn consumed, in consequence of the severity of the season, I can find no fault with the general result of my flock. In many cases, however, in t district the result has been far different. Some of my next neighbours have suffered heavy losses from the liver-rot, acquired probably during the very wet season in the middle of last corn harvest, by keeping sheep thickly on wet land. A large percentage of the sheep of this district were more or less tainted at the early part of the winter, and the severity of the season doubtless caused many to succumb sooner than they would have done in a mild winter. Cattle did not, where well fed, thrive amiss during the hard weather, though it told upon a few animals of bad constitution. From the heavy fall of snow, which lay very long upon the land, cattle were far more than usual in this district dependent upon dry fodder for their subsistence; and the hay-crop of 1878, one of the heaviest ever known in this district, barely sufficed to maintain the cattle through the long severe winter and cold last spring. I had my roots all secured before the hard weather fully set in, except 2 acres of cabbages which were carted out to cattle and yearling sheep in the snow in the early winter, and, although frozen, were consumed without difficulty. I attribute one or two cases of abortion in the cows to this use of frosted cabbage. Cattle have not, however, thriven so well as usual during the grazing season. They were cold and uncomfortable, and the grass was washy and deficient in quality as well as in quantity. The experience of managers of dairy factories who take exact measurement is that they had 25 per cent. less milk during the season from the same number of cows; and this was generally confirmed by private dairymen. Pastures, even when usually sound, were much trodden and damaged by heavy stock. In the valley of the Dove, where large numbers of cattle are fattened in the grass season, there was general complaint of the bad growth of the cattle, very many beasts having been worth little more than when turned out.

2. *Tillage Operations.*—My root-land was sown with wheat just previous to the hard frost; the seed lay in the ground nearly four months. On the drier land it eventually came well. On the strongest land the deluge of rain in March rotted much of the seed, and it came up thin. Spring corn went in well, the strong land working freely from the frost. The root-land worked very well, having been ploughed in October and November. My mangolds were all sown in April, but the cold weather hindered their start. The difficulty of keeping down chickweed and other condition weeds was very great. Swedes were a good plant, but in low places were much checked by the excessive wet.

Cabbages, of which most farmers in this district grow some, planting in May for autumn-consumption by cattle, were generally very poor. Many plants were destroyed or injured by the winter; and on all heavy land the excess of rain damaged, if it did not utterly spoil them. Though cabbages do not in ordinary seasons do well on dry soils, they suffer on all tenacious soils at least as much as any root from excessive wet.

Drainage, even where deep enough and with drains at moderate distances apart, has proved only a partial and inefficient remedy on clay soils for the damage produced by excessive wet.

Autumn cultivation in this comparatively late district is not always possible or desirable. Where the land is clean and tolerably free from annuals it is better ploughed deeply, without stirring the surface, early in the autumn, and then left untouched until the work of sowing roots is commenced in April or May, leaving the winter's frost to pulverise the soil. In a fine early season much good may, however, be done by working and cleaning in the autumn any dirty land.

As to bare fallows, the season was most difficult for cleaning them. I do not have them. I think any land requiring them regularly ought to be laid away to grass.

W. T. Carrington.

Staffordshire.—*Elford Park.*

1. *Live-stock.*—As regards sheep, the losses have been fearful, and this has not been confined to one district or class of farm. Men who never had a rotten sheep before have lost scores. Two or three cases occur to me: one

of 100 theaves and 40 hoggetts; another of 150, *all* the breeding flock; another of forty, and so on. None of these, except the hoggetts, were bought sheep, and they were kept on the ordinary pastures. All flocks had serious losses at lambing, principally from low fever, caused, I think, by want of nitrogenous food. I have little doubt but that my own loss of fourteen theaves was caused by this, not from want of food; but I think more *blood-food* was needed. During the last month of pregnancy, when the fœtus seems to develop rapidly, was the critical period. All that died, or were ill, were young sheep with twins.

Shropshire sheep are very prolific, and we induce this habit by feeding them on rather stimulating herbage at tupping time, so that we ought to be doubly careful in unpropitious weather, particularly if very cold and wet. Where it can be had, a good run of grass, with a few turnips—and, during the last month or so of pregnancy, a pound of oats, peas or cake, or a mixture of them, given with a little clover-chaff or bran—is a good flesh-forming diet. For similar reasons lambs needed young pastures and trough-meat during the spring and summer.

2. *Tillage Operations.*—As to the effect of the winter and spring on cropping, it may be broadly stated that the strong and cold soils suffered severely. Wheat was thin on the ground, and very backward. The earliest sown on such soils fared the best, from getting fairly rooted before the frost set in. Land of uneven surface, even where drained, lost plant in the hollows from the snow being drifted into them, and alternately thawed and frozen. The old rules remain: sow difficult working land early, on fairly rounded stetches; cut water grips, draw furrows, and do not harrow down too fine.

Barley, in consequence of the long frost, went in well, but was the worst crop of the season. Winter beans were a failure; they had many enemies beside the frost. The great loss of roots from exposure ought to teach every one that it is poor economy to neglect taking every care of such an expensive and valuable crop. We had to plough up our winter tares. Under an ordinary rainfall succeeding the long and severe frost, fallows, I have no doubt, would have worked admirably; but what we hoped would prove our blessing was our bane. The disintegrated soil admitted the water so freely and fully, and the quantity of rainfall being in excess and the temperature below par, any attempt at ploughing or scuffling the land simply puddled or plastered it; cleaning was out of the question, and a great breadth of roots was sown in a very unsatisfactory manner. Hoeing was simply transplanting weeds. All crops (seeds especially) have been much benefited by ammoniacal top-dressings; and an amount which, under a forcing season, would have been dangerous to the crop, has this year been absorbed healthily and, I think, economically.

G. A. MAY.

SHROPSHIRE.—*Church Stretton.*

1. As to the *live-stock.* The drop of lambs was usually in this district below the average, with very great losses during and after the lambing season, and the loss among the ewes was almost unprecedented. Owing to the wet autumn and severe winter, thousands of sheep have died from the rot or fluke in the liver; but on my own farm I have been wonderfully fortunate, as my loss has been nominal, although the drop of lambs was not large: 415 lambs, after the lambing season was well over, from 331 ewes, 21 of which were barren. Feeding-sheep did well on swedes, where they were well looked after; but in many places there were great losses from the roots being left exposed in the fields; and these did the sheep little or no good, if they did not even

go quite rotten. I had a quantity covered up before the frost, which k well until the second week in May, and finished off the hoggs by sheai time. The wool was not, as a rule, of such good quality as usual, owin suppose, to the great amount of cold and wet. Sheep, and especially lan did badly all summer; even when fed with cake they did not improve as t ought to have done, although they were all healthy and well, except that f rot was prevalent, and needed constant attention. The lambs scoure good deal, but recovered under the influence of constant change of past cake, and rock-salt to lick when they pleased. I am a great believer in —all animals are fond of it. Cattle did better than could have been expec and I had no disease among mine, nor many mishaps. They calved be than they had for years, and I had no case of casting calf, which I have b sadly troubled with for years. They were fed and treated exactly the s as usual.

Horses did well, but there was a great mortality among brood-mares foaling time, and many colts were lost. There were great complaints of m not standing to the horse, and mares were very late, as a rule, before com in use.

2. As to the *crops of the farm*. All my wheat, called "Red-straw White (I grow no other; it can be sown autumn or spring, and is a mixed red-a white variety of first-class quality), stood the winter well, except on wet places, and where the drains failed to act. What was sown after vetc eaten with sheep last summer, seemed to be the best. Most of my winte autumn-sown vetches entirely perished, and had to be re-sown in the spri and nearly all the roots left exposed rotted. On my farm some yellow bullo turnips, late sown, had kept well, and were useful in the lambing time; th were exposed to all the frost. The wheat sown late lay in the ground dur the long frost, and afterwards came up well without any damage. I supp it had not germinated when the frost set in. I have learnt by experie that in this district wheat cannot be sown too early. The last week in S tember and the first two weeks in October are, in my opinion, the best ti for sowing. It is of no use attempting here to do much in cleaning fall in the autumn, the weather nearly always stopping it. The best cours to plough well and deeply, and watch your opportunity to clean as early possible in the spring. Ridge up the turnip and mangold land, even if ro and dirty. Let it lie for a time, then harrow and split the rows, and the l can be cleaned with little trouble by picking the ridges and chain-harrowi &c., repeating the operation as often as necessary. It was almost impossi to get root-crops really clean last summer, however long we continued them, with scuffle, hoe, and hand.

JOHN HILL

August 19*th*, 1879.

HEREFORDSHIRE.—*Baysham Court, Ross.*

1. As to the *live-stock*. Never was the benefit of thorough draining, the advantage of having naturally dry soils, more apparent than during past twelve months; and particularly has this been the case for sheep. wet lands many whole flocks have fallen victims to liver-rot, and severe lo have been sustained in flocks where that disease was previously unkno The difficulty of retaining the health of our flocks upon dry soils has b great, and the mutton which has been made has been owing to a sev

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* See Report on Wheats, by John Morton, in the first volume of the 'Journ (1840).

outlay for feeding-stuffs, both corn and oil-cake. Where a liberal supply of dry food has been given, the ewes did fairly well, and produced a good lot of healthy lambs. The prevalence of foot-rot, or rather lameness from the blood-poisoning of foot-and-mouth disease, which prevailed so generally throughout the county in 1872 and 1874, has been most perplexing to both shepherd and master. Although the herds have been generally healthy, yet from the nature of the grass, and the continued rain upon the animals, it has been requisite to resort to artificial feeding to make beef with advantage.

2. As to the *crops of the farm.* The beneficial effect of thorough draining, or of naturally dry soils, is as apparent here as in the flocks. The wheat stood the severity of the winter, the subsequent wet spring, and the cold wet summer, better than any other cereal. But upon a very extensive portion of the poor, cold, wet soils of the county the wheat has scarcely paid for seed and labour. Particularly is this the case after clover, peas, beans, and vetches, as, from the continued wet seasons of the past two years, the slug, in addition to the perishing influence of the cold wet, has been most destructive; and the thin weak plant remaining was sadly choked with weeds which it was impossible to eradicate. It was quite the exception to see a field of winter beans, so completely were they destroyed. The effects of the late spring were but too apparent on the barley and oat-crops, with the exception of some early-planted barley upon the dry and highly-cultivated land. Severe losses were sustained from the action of the frost upon the uncovered swedes and turnips; and as the frost of 1879 commenced unusually early, it was the exception to see many covered, consequently the feeding-sheep and cattle were early forced into the market, and for a few weeks caused depression in price. Fortunately the abundant hay and fodder crops of 1878 enabled farmers generally to keep their store stock through the very protracted winter, but in very many cases the whole was consumed. The fruit, too, was very deficient, although one of the healthiest and most abundant blossoms ever seen. In fact the general prospect in this county is one of the worst I have ever known. The continuance of drenching rain upon the manure in uncovered fold-yards renders the purchasing of artificial feeding-stuffs disheartening, as also the attempts to cultivate undrained land. Covered fold-yards and drained lands are, I think, two of the most important requirements of the day.

T. Duckham.

Worcestershire.—*Lower Clopton, Stratford-on-Avon.*

1. *The Live-stock.*—The drop of lambs was an average one. They remained in a healthy state, owing to some vetches and rape (mixed) having been planted on the 3rd of March to feed them upon, which has produced an abundance of keep. Six pecks of vetches (winter), and 8 lbs. of rape was sown to the acre. I think this is the most useful food for lambs, and it should be planted in succession, to feed them at night, turning them on the clovers in the day. The cattle have not done so well, on account of the excessive quantity of rain.

2. *The Crops.*—The wheat remained in the ground without showing green from the first week in November until the latter end of February. The winter destroyed a portion of the grains, but still it wonderfully thickened, and on my farm looked very even. I only plant two kinds of wheat here, viz. Reedy Red and the Square Head—none after naked fallows. Barley comes after fallows, and has suffered more than anything else on my farm. It will not be anything like what it should be, for the land is highly farmed and all drained, and the seed was well put in. I had a good plant of clover, but the weather has been unfavourable for harvest-work. Winter beans were almost a failure

in this district; but I was lucky with mine, and got a very good crop. They were planted from the 16th to the 26th of October, all dibbled. They did not appear out of the ground until the first week in March.

The effect of the late spring and the drenching rains of the summer will be long remembered by the poor farmers. No fallows were profitable: a great deal could not be made fit for planting; and a great deal of land is going out of cultivation. With regard to land drainage, I consider a great deal of mischief has been done by cross-draining on heavy clay-land. The proper way, in my opinion, is to let the water go where it has been accustomed to travel. A great deal of land has been thrown out of its old ridge and furrow by the use of steam cultivation; and my opinion is, nothing will beat ploughing by horses, and keeping your land in ridge and furrow. Where the soil is the same as mine, the drains should be 3 feet deep at the furrows. Keep your master-drains well attended to, and there will be good results. It is the custom of many as soon as harvest is over to smash up the land, for the sake of getting rid of the annual weeds and being forward with the work; but my experience tells me that a good flock of ewes will clear all the annual weeds away and prepare it for the plough, when land is free from couch and docks. A great many sheep have been rotted in this district the last two years.

HENRY STILGOE.

BERKSHIRE.—*Cookham, Maidenhead.*

Wheat could not be sown late in the autumn of 1878, or early in the spring of 1879, on account of the rain and frost; and the prospect as to future prices appeared so unsatisfactory that few were tempted to risk late spring sowing, consequently the acreage of wheat was exceptionally small. The character of the season, so unsuitable for the maturing of this crop, produced its natural result, and we had on this small acreage a bad yield of inferior quality, much of it stacked so hastily as to unfit it for immediate threshing. Probably 3½ quarters to the acre will be found on some of the better lands, but much will yield considerably less than this.

Barley and oats suffered less than the wheat; but there are no full crops of either, and in many cases the crop is miserably deficient in yield and quality, and a large proportion was carried badly, the late season having induced too great haste, considering the large undergrowth of clover or rubbish. The settlement of many ricks and the steam arising from some told their tale.

The hay-crop, both clover and meadow, although late, was good in bulk; but the continuous rain, or rather the very short intervals without rain, rendered it almost impossible to get it together in good order.

Root-crops need sunshine as well as rain, and suffered severely from the want of it. A few fair pieces of mangold-wurzel were seen, but the swedes were small and poor in the extreme; their growth appeared to have been stunted, and they looked starved, even on the best lands in good condition. Rape was a good deal grown as a forlorn hope, but it was scanty and bad, and altogether the prospect for sheep keep was far worse than I ever knew it. Potatoes were almost a failure, although there were a few exceptions where the coarser sorts had been grown on fresh and dry ground.

The ground generally got very foul—not only the stubbles but even the fallows—as it has been impossible to clean land.

The late harvest added to this difficulty. Harvest began about September 1st, and was not finished till nearly the middle of October.

It must be understood that the remarks I have made as to yield of the corn-crops apply to the loams and lighter lands in this district. The state of the clay-lands and low-lying Thames lands has been lamentable. I have heard of good clay farms on which the yield of *all* kinds of corn is put at less than one quarter per acre. Meadows near the Thames were in many instances flooded to such an extent that portions of the crop which had been cut were carried away or completely spoiled, while other portions, varying from 2 or 3 to 50 or 60 acres on a single farm were left uncut.

The fruit-crop has proved a very bad one. Altogether the season has been most disastrous to the English farmer; a result due, I believe, to the special character of the weather we have experienced, viz. excessive rain and the absence of sunshine.

W. Bulstrode.

BUCKINGHAMSHIRE.—*Woolston, near Bletchley.*

For over forty years my regular practice has been to winter my ewe flock by a run in the grass-field in the daytime, and folding them in the yard at night, feeding them in cribs with bean-straw. They had always done well, giving a good healthy lot of lambs. In the autumn of 1878 my ewes were unusually strong; and I treated them in every respect as I had done in former years. They remained healthy and strong throughout the winter, yet they gave me a poor fall of lambs—20 per cent. either dead, or so weak that they could not live, and 80 per cent. that did live were unusually weak, and did not do well till I had weaned them. The weakness of the lambs must have been caused by the cold winter; but why it should have been so I cannot understand, for the ewes came out strong at lambing time, with a full supply of milk about them. My tegs that I put upon swedes, cake, corn, and hay for the winter suffered by cold the most, for I lost some 10 per cent. of them by inflammation of the lungs. I lost by the same cause only 1 per cent. of my ewe-tegs that are kept for stores; they lay all through the winter in the grass-fields, receiving ½ pint maize daily, and some hay when the ground was covered by snow. All that was the matter with my sheep through the winter was inflammation of the lungs, and the curious fact is that the ewe-tegs that were left in the field to take care of themselves suffered the least.

I have no fallow, my land being now all seeded down for permanent pasture.

William Smith.

NORTH NORFOLK.—*North Walsham.*

1. *Live-stock.*—Our farm contains between five and six hundred acres arable. We farm under no particular course, but grow from one-fourth to one-fifth of our land with roots, part mangold and part swedes. No sheep are bred, and but few kept, the soil being more adapted for cattle-feeding, carrying about 200 head between the autumn and spring, fattened for the London and local markets. Our experience of the two past seasons has been anything but pleasant or profitable. Our cattle retained their health through the winter; but, although fed extravagantly high through winter, they fattened very slowly. This we attributed to the inclemency of the weather and the want of more shelter, our yards being too large in proportion to the sheds, causing a further loss in straw for bedding, and a still greater one in the destruction of manure, the continued rains and snow washing away its more fertilising ingredients. We are now building more shedding, indeed covering in the greater portion of the yards, to prevent a repetition of this loss, which we believe, during the past three seasons, has more than equalled the cost of the buildings now in hand.

2. *Crops.*—We had a good crop of corn in 1878, and secured the greater

portion of the wheat in good condition; but our barley was injured by the excessive rains that followed, to the extent of from 10*s.* to 20*s.* per quarter. The wheat that was left was much sprouted, and damaged from 3*s.* to 8*s.* per quarter. Some of this loss might have been avoided by an earlier commencement of harvest, and by more care in setting up the wheat after the reaper, the sheaves requiring to be set up straight and firm, and not too many in a shock; ten are sufficient, or even fewer, if placed in a circular form to represent a cone. After the completion of the harvest of 1878 we had a brief interval of fine weather, which enabled us to do a little in the way of autumn tillage; but a rainy season again set in, continuing more or less till the month of December, when snow and frost visited us. We succeeded in getting about three-fourths of the autumn-wheat sown, and with much difficulty got the mangold off the ground and secured. This crop was good; the swedes scarcely an average. There was no chance to secure or store any of the latter; numbers of acres entirely destroyed by the frost, were cut up in the spring and ploughed into the land for barley, resulting in a laid crop. This manuring proved more potent than a fair dressing of nitrate of soda and superphosphate.

Wheats on wet and undrained land were thinly planted, and altogether a very indifferent crop; and even upon dry sound soils, both spring and autumn-sown, bulky and apparently good, proved a disappointment, the ears being more blighted and defective than we had ever seen them, and the yield generally bad. What otherwise could be expected from the extraordinary wet season they experienced? Barley on the strong and wet lands was a miserable failure; but on well-farmed porous soils not to be complained of. The same may be said of oats. Winter beans were in this district entirely destroyed by the frost. The land was well-manured in the early spring and resown with spring beans and peas. The former promised a fine crop; the latter a very indifferent one.

Both mangold and swedes were a good plant, at least upon all light or mixed soils, but filthy in the extreme. It was impossible to destroy the weeds, especially the chickweed, which grows as fast as it is cut. Potatoes, both early and late and of all kinds, were universally diseased.

I have farmed for a period of forty years and never remember a season so fraught with disaster, nor one likely to be attended with such serious consequences to the English farmer.

W. Cubitt.

Hampshire.—*Northbrook, Micheldever.*

The drop of lambs was an average one, but there was a large number of deaths among the young ewes. Horses and cattle kept in good health, and the pigs in very good health. After clover the wheat looked very thin in the early spring, but improved greatly afterwards. On the mangold ground the wheat appeared to be little affected by the cold winter, but it did not continue to do so well afterwards. After turnips, fed off by the sheep, the wheat always promised fairly. Rivett wheat after wheat looked bad all along; it was sown late and was hardly up when the frost began. The varieties grown are Mixed Red-and-White, Bromwich, Golden Drop, Square Head, Club Red, and Rivett. With exception of the Rivett, as noticed above, no particular sort appears to have suffered more than another. My impression from observation is, that the late frosts and snows and cold weather did more damage to the wheat than the severe weather of the winter.

The winter frosts made a splendid seed-bed for the barley and oats, and the dry weather of March (when the rainfall here was only ·84 in.) was very useful for cleaning the land. The soil here being light, on chalk, there is no draining required, and were it not that the hay-crop was damaged seriously, prospects would have been good, as wheat, oats, and barley did fairly well. I was during the spring a good deal on some heavy land in Essex, drained 4 feet deep, and examined some of the drains; the land was soaked with water, and the crop ruined. The pipes were about a quarter full of clay, but I could see no evidence of their being stopped up entirely, yet there was almost no water running out of the main outfalls. The conclusion I came to was that the frost had pulverised the clay, and the rainfall of April, May and June had beaten it down and almost puddled it, rendering it impervious, and preventing the water getting down to the 4-feet drains. A depth of 3 feet would, I think, have given a better chance. On this heavy land all the crops were bad; but the damage chiefly resulted from the excessive rain of the summer months and the low temperature during that period.

JAMES A. CAIRD.

HAMPSHIRE.—*Chalcombe, Winchester.*

1. *Live-stock.*—Hampshire is one of the largest sheep-breeding counties in England, and the Hampshire Downs, which attain enormous weights and are especially remarkable for early maturity, are almost exclusively kept. Their flesh is nearly if not quite equal to the Southdown. I have had them 100 lbs. weight at 9 months, and I have sold 100 to the butcher at that age at 80*s.* per head. The lambing season begins early in February, and at that time there was last year abundance of hay and a fair quantity of roots, but the hay was bad and the roots became affected by the frost. Cake was generally used after lambing with the doubles and young ewes, but, notwithstanding, the flocks fell away in condition, and the breed of lambs was worse than I ever knew, and more ewes died. The flocks of the county were worth less in the spring as couples than the ewes alone would have made in the previous autumn. They had more than lost their winter's keep. The cold and late spring caused a working out of the hay, and green food was slow in coming; till in May the rain came on and thereafter continued, so that the roots were got in with difficulty and could not be hoed, consequently many acres have been ploughed up, or fed off prematurely with the weeds.

Few cattle are kept in this county, as there is little pasture beside water-meadows, which are usually kept for sheep, with the exception of farms near any railway station which supplies milk to London; and as the cows are kept in a very artificial way, the severe winter had no especial effect upon them. A few Irish steers are bought to eat straw and cake, but, owing to the extreme cold and the fall in the value of cattle, they were not a success last year.

The autumn of 1878 was not unfavourable for sowing and general cleaning and cultivation, and steam-tackle was freely resorted to. I have two double sets of Fowler's tackle; but there are also many sets let out at a moderate rate. The wheat was put in well, but so cold was the weather that much of it never made an appearance for four months and then, especially the Rivett, looked very sickly and thin. On the light lands the frost thinned it, and on the heavy the wet had the same effect. The crop looked worst on the latter description of land, and altogether was a bad one. The spring corn was well planted, and the oats looked well and were the crop of the season. Barley was fairly good on well-farmed light land, but useless on heavy, wet and cold ground. Fine weather was sorely needed for everything; first, to save the hay; then for cleaning roots; and lastly, but not least, for all varieties of corn.

J. STRATTON.

SUSSEX.—*Chichester.*

1. *Live-stock.*—Horned stock, where fed on hay, thrived well, even with a smaller amount of roots than usual, the hay having been harvested in prime condition in 1878; but those fed on straw, with the usual amount of roots, did badly, straw of that year's growth being very inferior. We were very free from disease amongst stock. Sheep did well, with very few losses; but the drop of lambs varied a great deal. The forward ewes, lambing about Christmas and January, did very well, with a capital fall of lambs for early fatting. The flock which lambed from middle of February to middle of March did very badly, losing a great many ewes, with a very short fall of lambs. I breed from my ewe-tegs at twelve months old. They lambed from middle of March till middle of April, and did well. The forward ewes were Hampshire Downs, in-lamb when I bought them (end of August). I allowed them as many roots as they liked to eat, with about 1 lb. of hay apiece daily. The flock (Southdowns) were allowed very few swedes, as much cut chaff (half hay and half oat-straw) as they would eat, and about $\frac{1}{3}$ lb. of best linseed-cake daily from the beginning of January. The ewe-tegs had as many white turnips as they would eat, 1 lb. of hay per day, but no cake before they lambed. The forward ewes were kept on a medium soil, light brick-earth, and lambed there. The flock we kept on a strong brick-earth, and lambed there. The ewe-tegs we kept in the same field as the flock until they began lambing, then they were sent to the homestead where the forward ewes were keeping, and lambed in the same fold. The ewes and lambs did not do well during the summer, suffering a good deal from foot-rot and the great amount of moisture in their food; but they kept healthy till they were weaned.

2. *Crops.*—I do not generally begin wheat sowing before October 20th. We had a very wet time to put it in, and some land which would have been sown with wheat had to stand over for spring-sowing. After the wheat was sown it lay in the ground longer than I ever knew it before; and when it did come up it was with a very weak shoot, which could not make way against the hard weather we had. Wheat after rape or fallow-crop answered best, then after fed lea, and the red-clover lea was worse than any other. In the same field you could see to a foot where the red clover grew. Much of it was a failure altogether, and had to be ploughed up or re-sown. Red wheats appear to have stood this trying time much better than white, promising a large return. In my neighbourhood we have a wheat peculiar to this district, called "Old-fashioned Red and White-strawed," being a mixed wheat; the red having white chaff, similar to Red Nursery, with a bolder berry. This sort was one of the worst this year, after Talavera and Fluff, which, however, are very little sown here. I have sown a considerable quantity of Biddle's Imperial* for several years; it answers well on our fed leas, having a stiff straw. Being very heavy in the bushel, millers are very fond of it after buying it a few times. It was introduced here a few years since by F. Padwick, Esq., of Thorney, who had the seed from Herefordshire, whence we get a change of seed now. It grows very much more white after being grown here a few years. I did not sow any wheat in the spring, but I hear it is better than the autumn-sown. Owing to the wet weather, barley and oats were not sown so soon as usual by a month, not beginning before the 8th of March; but it was a very good seed-bed for our land, the hard frosts having pulverised the land wonderfully. They came up, and promised well.

As to cleaning the land and preparing for the root-crops, it was quite impossible if not done in the autumn of the previous year. I was fortunate in having my worst pieces done at that time, for any that was not attended to then could not be done in the spring or summer, especially where the land was not drained. I have been long enough in my farm to get my ditches and water-courses well out, and to drain most of the land to a depth of 4 feet 6 inches. It has also been drained with the old turf or wedge drains some years ago; these we cut asunder and fill up with broken chalk down to the deeper tile-drains. This plan carries the water off very quickly, and I begin to think almost too quickly, for I am afraid the water takes some of the properties of the manure down with it, the benefit of which is lost to the land. This evil, however, we must not mind so much as stagnant water, which is injurious in any year, and more in a year like the present. Mangolds did not like their circumstances at all, and not more than a fourth of the ground sown remained with a crop of mangolds on it. Swedes and turnips did better and grew away well; but the continued wet prevented their being sown so soon as usual by nearly a month. The weeds started and raced with the young plants. Labour being plentiful, we could check this by hoeing, but it did not kill them. I am speaking only of my own farm and of crops grown on the level land below Chichester. I hear they were very bad on the hills and in sandy land. I think I should have stated that where roots were sown after once ploughing in summer they looked best; in other years we could get nothing worth speaking of without two or three ploughings.

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* See p. 109 in the 'Journal,' vol. x. s. s.

C. J. DREWITT.

DORSETSHIRE.—*Waterston, Dorchester.*

1. *Live-stock.*—The winter of 1878–79 was the most trying for sheep I ever experienced. My stock consists of 950 flock ewes and about 400 hoggetts; the latter were kept on roots and hay (swedes from November to May) and did fairly well; the roots were pulled beforehand, but not cut for them. The ewes were well kept, and fed as carefully as possible on turnips and hay, with a run on old pasture part of the day, till the end of January. If the turnip land was wet, they were not allowed to lie on it. About a week before they commenced lambing they were given some old hay on grass; and a yard was prepared to put them in by night, should the weather be rough. The first part of the lambing time it was very cold, but dry; the lambs came strong, and the ewes were healthy. We generally lose some ewes at this period from straining. When the snow came, with cold rain and wet and mud under foot, we found a change; lambs were born apparently healthy, but died when two or three days old. Ewes did not get over their difficulties so well. A plentiful supply of straw was at hand, but the latter part of the lambing was not nearly so good as the beginning. There was a large proportion of twins, or the crop of lambs would have been very deficient; as it was, we were 150 short, and lost 4 per cent. of ewes. The sheep did badly all the spring. They were well supplied with swedes, hay and grass, and had the run of the young clovers, and the mothers of the wether lambs had oats for a time, but never did so well as usual. When put in the water-meadows in April, both ewes and lambs scoured very considerably. We lost lambs continually.

I believe the swedes, although not rotten, were of inferior quality, from the effects of the severe frosts; and all green food, turnip-tops, clovers and grass, from lack of sun and the low temperature which prevailed all the spring, were not so wholesome or nutritious as is generally the case. Fortunately the previous year's hay was both good and plentiful, and the sheep were supplied with it for nearly seven months. My sheep stock had most attention, caused me more anxiety, and I think suffered more from the past untoward season than anything else. Many ewes pined away and died in the spring from the effects of this winter. Some of my neighbours were equally unfortunate. I believe farms exposed to the north and north-east suffered most.

My dairy of sixty cows lived in yards on straw, with cake, and a few roots, or a run out by day on some rough pasture, and did well and calved all right.

Horses had an easy time of it. Some days during the hard weather they were not out; but two or three were nearly constantly employed carting roots to the sheltered spots and leeward hedges for the sheep.

2. As to *the crops of the farm.* My system of cropping is the seven-field; viz. 1. Wheat; 2. Barley; 3. Roots, preceded by Italian rye-grass, rye, winter barley, trifolium or vetches in succession; 4. Roots, rape, or kale; 5. Corn, chiefly wheat with clover seeds; 6. Clover, mown for hay; 7. Clover.

Wheat was all sown in October and November, but it made little growth all the winter; in fact, much of the wheat-land looked like a bare fallow. The plant was always thin, but I do not think much was killed by frost. On very light chalk-land it was sown after the presser, and consequently was well buried. In March, which was fortunately a dry month, it was rolled, well harrowed, and rolled again; and ultimately looked far better than I ever expected. The surface filled up, except in some spots, and the ears were a good size.

Barley, chiefly after wheat-stubble (which was smashed up after harvest, and well worked and cleaned in the spring) was well put in, except on strong land, which should have had an extra ploughing if fine weather could have been insured. Even that was well pulverised by the frost and had a good surface; but the quantity of rain in June (nearly 6 inches) was a great injury to the barley, making it look very yellow; and the flag became struck with rust and blighted.

Oats were generally good; the wet season has suited them.

Clover afforded a fair cut, though fed late. All hay was more or less damaged.

We now come to the all important root-crop. I sow about 200 acres of the various kinds, for feeding in succession; and my system gives nearly half this quantity after a previous root-crop. This enables me to get the land in order without much trouble, and to drill mangold, rape, or kale, as soon as barley sowing is completed. My land this year was therefore prepared, and the bulk of the crop got in before the heavy rains of June and the beginning of this month; and consequently I had a capital plant of all kinds, each made vigorous growth; and a good part of the hoeing was done. The early part of the season the fallows worked exceedingly well, thanks to the frost; and none of my crops suffered from turnip-fly or wire-worm.

I will only add that I have a great variety of soils; some very light, on gravel and sand, some strong clay with large flints; but the greater portion of my farm is a chalky loam, not very deep, with chalk subsoil; and being naturally dry, I was not impeded in my work by the wet spring to any great extent.

RICHARD GENGE.

A succession of local reports, each of which possesses some special interest, is more likely to be studied than a formal essay would be, in which the general result extracted from them might be presented to the reader. These reports have therefore been given separately; and there only remains the task of pointing out a few of the more important lessons which they seem to teach. In the first place, it must be acknowledged that even the picture of misfortune, gloomy as it is, in which they concur, does not sufficiently represent the disastrous truth of the past agricultural year. Great as the losses have been, and general enough to override and overwhelm such attempts at resistance or recovery as might, under a less severe infliction, have presented us with useful and instructive results, the picture given of them in the above reports is insufficient in almost every aspect. They were for the most part written immediately before harvest; and although most of them have been since submitted to the writers, and have received their corrections up to a more recent date, there is, nevertheless, a great deal of disastrous experience which has since been realised. The character of the corn-harvest has been ascertained beyond a doubt by the threshing-machine. And the true dimensions of the unprecedented prevalence of the liver-rot in sheep have become more accurately known. Both of these experiences are a true consequence of the weather during the period covered by Mr. G. J. Symons' Meteorological Report in the outset of this paper. The weather of the subsequent months, unusually severe though it has been, has been also unusually dry; but it has been as little able to remedy the mischief done by the previous wet season on the health of our flocks as it could be to remedy the evil done to the wheat-crop already harvested. The sheep-rot, the germs of which had had such scope given them by the wet weather of the season described by Mr. Symons, had only begun to display itself when these reports originally came in. Since that time the disaster has assumed really national proportions. Even in dry and arable counties, such as Norfolk and Sussex, which have certain marsh and grass-land districts, instances of the destruction of whole flocks are reported; and the county and agricultural papers have been full of cases of the kind in the midland and western counties, where grass-land is more general. Examples, quoted by the 'Bradford Observer,' from the correspondence of a local firm of wool-merchants, are given of the enormous losses of sheep-farmers in the counties of Northampton, Warwick, Worcester, Oxford, Stafford, Gloucester, Somerset, and Devonshire; and it cannot be doubted that the next annual Agricultural Statistics published by the Board of Trade will show a marked diminution of the sheep-stock throughout the country in consequence. In low-lying districts, and on badly-drained pasture-lands, the losses have been ruinous.

The experience of the corn-harvest is perhaps reported with sufficient truth in the correspondence given above. It was accurately anticipated, both from the appearance of the crops in the ripening ear, and from the knowledge that a wet and cold May and June rendered it certain that the actual yield must fall below the promise of the harvest-field. Accordingly, of the returns to the 'Agricultural Gazette,' given in the midst of harvest-time, more than three-fourths of the reports of the wheat-crop, and three-fifths of those of the barley-crop, stated it to be below an average. The oat-crop, indeed, was the only fair corn-crop of the year. Mr. Lawes' account of his experience at Rothamsted gave an even more disastrous picture of the corn produce of the country; and in the 'Times' of March 3, Mr. T. C. Scott has pointed out that the quantity of home-grown wheat reported as delivered at market during the first six months since last harvest has been only 3,276,000 quarters as compared with 5,873,000 quarters during the corresponding period of 1878–9. "The quality indeed of the home-produce has been so exceptionally inferior, that much of it has been given to live-stock, and has not therefore appeared in those returns" this year. To appreciate with accuracy the position of the English farmer generally, however, we must, to losses in the flock and to diminished receipts in the corn-market, add the very dirty condition of much of the arable land; and, above all, the great loss of capital due to a succession of bad seasons. It is certain that fallows never were fouler than they were last autumn; and flock and stock and farm capital were never lower than the seasons described by Mr. Symons have left them. No wonder that one of my correspondents in Lancashire adds to his report,—"Farmers have at length been taught when valuing the rent they can afford to give, to take into their consideration what effect a succession of bad seasons may have upon the occupation."

A large number of reports have reached me from many English and Scotch counties for which I have not been able to find room. They tell the same story as those already quoted. Mr. W. Smith, of West Drums, Forfarshire, after relating his experience, says:—

> "This is a gloomy enough picture, but I am very sure it is not overdrawn. I have farmed a pretty large extent of arable and pasture land since 1836, and I have a registry of farm operations ever since I put my hand to the work. I have recorded no such season as the present in all that time. The lessons such seasons teach are really few. We cannot contend with Nature in such a mood. Had the calamity been confined to one year it might have been got over, but after a succession of bad seasons this one will, in my opinion, be the ruin of thousands of even our comparatively well-to-do men. It is believed that nothing has been known like it since 1816, which our fathers spoke of as next to 1799 and 1800, as being the most fatal year in farming on record."

This inability to furnish lessons is a consequence of the overwhelming degree of the general failure. Applying to Mr. C. Randell, of Evesham, for instance, for any experience he might have, in which drained and undrained land could this year be contrasted, he replies, "I cannot help you. The wet, cold season has told on all land—clay (drained and undrained), gravel, sand, and chalk—alike. Strange to say, some dry lands seem to have suffered more, especially in quality of both wheat and barley, than heavy clays. Grass-land farmers are not much better off. Feeding, dairying, and young cattle have all done badly. Sheep almost everywhere are more or less affected by the rot." If any lessons at all can be gathered, they are, as regards the winter and early spring months, in the words of a Lanarkshire correspondent (1), early and comfortable housing of all cattle on the farm; and (2) early securing and storing all green crops before winter against loss, however promising the season may appear to be. The advantages of covered yards for stock, and of energy and activity at harvest-time whether of corn or roots, are undoubtedly among the experiences of the period we have passed through. And, as to land drainage, whether an overwhelming and continuous downfall of rain has or has not made clay-land—drained and undrained alike—equally unmanageable and unproductive during 1879, we are not likely any the more to lose our confidence in it as a necessary first step to good and economical management, whether of soil or manure, in all ordinary seasons.

The two principal lessons of the year appear to me to be represented best of all in the letters from Mr. C. Randell, of Evesham, and Mr. G. Brown, of Watten; and they point to liberty of action, as affording at once the opportunity and the stimulus of the tenant-farmer in all cases of unusual difficulty, whether due to weather or to markets or disease. Mr. Randell in particular advocates liberty for the cultivator to choose what crops he shall grow and how he shall dispose of them; and Mr. Brown gives an admirable example of what activity and resolution may accomplish in the circumstance of a most difficult harvest-time.

I cannot do better, in conclusion, than recommend any one who may have followed these pages hitherto, to turn back to the beginning and read once more the communications from Mr. Randell and Mr. Brown, which head the long series of instructive and valuable reports of which this paper for the most part consists.*

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* It is hardly fair to the hay- and corn-drying machine of Mr. W. A. Gibbs, of Gillwell Park, Chingford, Essex, which he has been for many years urging on the attention of the farmer, that this reference to its efficacy, as one of the lessons of the season, should be placed only as a footnote to a page. It will, however, perhaps be more likely to catch the eye by its separate position here. And it is very desirable that it should not be passed over. A model was exhibited at Kilburn, and the machine itself was shown in operation not far from the Show-yard. There is now ample testimony to its efficiency, and, though I cannot yet speak from personal experience, there seems to me no reason now to doubt that

XIV.—*Observations on the Disease of the Cow, commonly known as Dropping after Calving.* By JAMES BEART SIMONDS, Principal of the Royal Veterinary College.

UNDER various names, such as Drop, Dropping after calving, Milk fever, Puerperal fever, Adynamic fever, Parturient apoplexy, &c., a fatal disease attacking the cow shortly after or even occasionally before or at the time of parturition has long been recognised.

In days gone by the pathology of the malady was very imperfectly understood, and consequently the most conflicting opinions thereon were promulgated by writers on cattle pathology, as well as by practitioners of veterinary medicine. Even in the present day it cannot be said that a uniformity of opinion prevails, many persons still clinging to the views which were first advanced by the late Mr. Youatt, in his work on 'Cattle, their Breeds, Management, and Diseases' (1834), viz. that "this disease is primarily inflammation of the womb or of the peritoneum, but that it afterwards assumes an intensity of character truly specific." With more correct views, however, other authors and practitioners now regard the disease as *non-inflammatory*, and as being dependent on functional derangement of the brain and nervous system.

THE NAME.—I abandon all other names to give preference to *Parturient apoplexy*, notwithstanding that some of them may convey to the mind the existence of well-marked symptoms of the disease, such as *Dropping after calving*. The term *Milk fever* I also hold to be inappropriate; but by no means so much so as *Puerperal fever*, which strictly means "Child-bed fever," and consequently ought never to have been used in connection with parturition of the cow. Like dropping after calving, *Adynamic fever*[*]—loss of power associated with fever—points to the inability of the animal to rise; but beyond this we learn

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at a cost not much exceeding that of ordinary haymaking in average weather, the last stages of the process can, in a difficult season, be accomplished artificially with economy and success. Such a testimony as that of Mr. Roddick, of Quintain Hill, Waltham Abbey, certainly deserves attention: "Nineteen loads of damaged hay, which would otherwise have been useless, were rendered fit for stacking at the rate of 2½ loads per hour. I realized 60*l.* or 70*l.* by the day and a-half use of the hay dryer." Mr. Ainsworth, of Smithells Hall, Bolton, also writes: "I have saved a Dutch barnful of hay during rain and without any roof over the machine." We are none of us disposed to make permanent costly preparation against what is only an exceptional disaster; but on the home and central farms of an estate, and on large farms anywhere, and among the plant of those contract men whose services for threshing, steam-ploughing, drilling, &c., are in most districts to be hired, it seems no longer doubtful that Mr. Gibbs's hay and corn dryer should find a place.

[*] In another part of this Essay I shall speak of Adynamic fever in connection with an animal's incapability to rise when pregnant.

nothing by the addition of the term either of the symptoms or nature of the malady.

It was not until 1836 that an effectual effort was made to get rid even of the name of Puerperal fever, then so generally applied, and also of the disease being of an inflammatory nature. In that year an animated discussion took place in the Veterinary Medical Association, when the late Mr. Youatt stated that his opinion of the nature of the disease had undergone a change, and that he took strong objections to the name of Puerperal fever. Many of the speakers nevertheless defended both the name and the inflammatory theory, while others considered the digestive organs as being chiefly implicated. Some spoke of the secretion of milk being arrested, but only one or two drew attention to the evident derangement of the nervous system. The most definite opinion, however, of the nervous system being chiefly involved, was at that time expressed by the late Mr. Friend, of Walsall, who, in a communication to the 'Veterinarian,' wrote as follows: "I consider the disease to be one originating in the organic motor nerves." The dim light which was thus shed on the pathology of the malady was, however, only discerned by a few practitioners, and for three or four years longer the pages of the 'Veterinarian' continued to be occupied with conflicting opinions, both on the propriety of the name and the pathology of the malady. Progress, however, was made; and in 1840 the writer of the present paper went beyond many members of the profession who even regarded the nervous system as principally involved, and expressly stated that such derangement depended entirely on an *apoplectic condition of the brain and spinal cord.*

Experience has shown the correctness of this view of the pathology of the disease, and hence the appropriateness of the name, *Parturient apoplexy.*

SUSCEPTIBILITY.—No animal of the farm except the cow is the subject of the malady, although all are liable to be attacked with inflammatory and other diseases at the period of parturition. Even with cows, all are not equally predisposed to parturient apoplexy, young being less so than aged. Heifers producing their *first* calf when about two years and a half old may be regarded as altogether insusceptible, and the same may be said with reference to their second calving, as a rule. Succeeding labours, however, are attended with greater danger even up to the time that the cow may be rightly designated an old one.

Potent for evil as advanced age undoubtedly is, it cannot, nevertheless, be affirmed that the oldest animals will be attacked, for daily experience proves that many a middle-aged cow will fall a victim to the disease, although there are older animals in the same herd. The capability of a cow to yield a large quantity of milk exercises considerable predisposing influence, and bad milkers are therefore, as a rule, found to be far less susceptible to the disease. As the mammary glands may be said to be at their fullest development, if not immediately at their greatest activity, at the *third* calving, so it would appear that adultism becomes more dangerous when combined with the power to produce a full lacteal secretion at the time of parturition.

Besides this combination, susceptibility is greatly increased by breed: well-bred Yorkshire cows and *English*-bred Jersey cows being most susceptible, thriving Suffolk and Ayrshire and Dutch cows following in the rear. Well-bred animals have, as is well known, an hereditary predisposition to early maturity, and even plethora. And although it cannot be said that "good milkers" are plethoric animals, still an innate tendency, depending on breed, to accumulate flesh, materially adds to their susceptibility to be attacked with the disease. Generous feeding, more especially if associated with this hereditary predisposition, and a capability of yielding a full quantity of milk, will necessarily increase this liability. It has often been observed that cows of this description, which in the latter period of utero-gestation have ceased to give milk, and are generously fed, and perhaps allowed to remain at pasture in the summer when the rest of the herd are driven home for milking, have their susceptibility even thereby increased. These several things explain, in part, the well-established fact of the disease being prevalent in some districts and rarely seen in others.

Some persons have sought an explanation of this localisation of parturient apoplexy simply in the character of the soil, the rich quality of the food, and the generous feeding of the animals. It is true that on sandy and poor soils the malady is rare; but its prevalence in other districts does not exclusively depend on an opposite condition of the soil, nor on the good management or richness of the grazing land, nor on the high feeding of the cows; nor, may I add, is it due to the large number of animals which are kept within a limited area. In many dairy districts, where these conditions exist, but where well-bred and good milking cows are sparsely distributed, very few cases of parturient apoplexy are seen. I am practically familiar with many such districts, as with others where the malady is exceedingly rife.

In speaking of the causes which favour predisposition, the influence of the weather must not be lost sight of. In the height of summer, although fewer cows may calve within a given area, more cases will occur than in the spring, when the larger number of calves are born. It is also noteworthy that in some years the disease is comparatively rare, while in others it is very prevalent.

In considering the predisposing causes of the attack, attention may also be directed to the conformation of bovine animals, their liability to great excitation at the time of parturition, and their idiosyncrasy or natural tendency to brain disturbance especially when suffering from diseases which implicate the functions of the stomachs, and none the less also of the uterus and other organs. Compared with simple-stomached herbivora, and with many other ruminants, bovine animals are short-necked, and are provided with a more capacious venous system for the return of the blood from the brain. This latter anatomical peculiarity probably depends on the greater length of time which they naturally occupy in grazing, and the necessary pendent position of the head during the whole of such time.

The shortness of the neck may, however, exert an influence also in the production of that excited condition of the brain which is often observed both in cows and heifers immediately after parturition in the defence of their young. Their ordinary docile habit is not unfrequently changed to such an extent as to amount to parturient delirium, rendering it dangerous to approach them, and not unfrequently leading to their killing their offspring.

Conformation and advanced age in cows, as in the human subject, are powerful agents in the production of apoplectic attacks. Susceptibility is also increased by a previous attack. Cows which recover from the disease are exceedingly liable to become victims to it at the next calving. Exceptions are, however, now and then met with ; but the danger is so great that no risk of the kind should be run.

In the preceding observations I have endeavoured to explain most of the causes which increase the susceptibility of an animal to be attacked, and I here add that among such causes is that of the period of utero-gestation being fully completed. The malady does not attend, or very rarely, on abortion or premature labour, nor even on protracted labour, especially if manual assistance has been necessary to effect delivery.

Inflammation of the uterus, with which dropping has so long been confounded, follows commonly enough on *first* births, and in *young* and also *impoverished* animals and *bad milkers*, as well as on cases of *abortion, premature labours, and mechanically-assisted deliveries.* These, indeed, are fruitful sources of inflammation of the uterus, but not of apoplectic attacks.

Another marked difference between the two affections is the time which elapses subsequent to delivery and the occurrence of ill-health. Inflammation of the uterus rarely shows itself before the fourth or fifth day after parturition, and is always preceded by febrile excitement and its concomitants, whereas, as has been stated, the susceptibility to parturient apoplexy has either greatly diminished or entirely passed away, by the expiration of the third, or fourth day at the furthest, after delivery. Coma also does not necessarily belong to inflammation; but it is the leading diagnostic symptom of "dropping."

Again, in inflammation of the uterus, death rarely follows in less than four to five days; while in dropping, forty-eight hours, with very few exceptions, is the extreme period of duration. Cows which, as "in-calvers," are sent from market to market, undergoing exertion thereby, are rendered less liable to dropping, but not to inflammation. Lastly, I may repeat that every variety of animal is liable to inflammation of the uterus, but the cow only to parturient apoplexy.

PATHOLOGY.—From what has been advanced, it will be seen that I regard "dropping after calving" as true apoplexy, due to the act of parturition. In what way the apoplectic attack may be caused is not so easy to determine. Some persons have spoken of its production by the "throwing back into the system of the access of blood which had been sent to the fœtus" *in utero.* Strictly speaking, no such throwing back takes place; the fœtus having its own independent set of blood-vessels. It is quite true, however, that by the contraction of the walls of the uterus after delivery its vessels are closed against the passage of the blood to a very great extent, and consequently for a time repletion of all the other vessels of the body may be said to exist. Doubtless the rapidity with which balance of the circulation is obtained will be in proportion to the activity of the several secretory organs, and perhaps by none more so than by the mammary glands. A free secretion of milk, especially charged as it now is with *colostrum*, gives earlier and more complete relief to the vessels than would be afforded by any other secretion—milk and blood being so closely allied in composition. It is, however, to be remembered that this secretion often precedes parturition, and continues until arrested by the apoplectic attack; and not only so, but until coma succeeds, and that during this time all the other secreting glands are apparently in a state of activity. Simple repletion of the blood-vessels, under such circumstances, would be early removed, and doubtless fairly completed by the third or fourth day, not *until which time*, however, will the attack in many instances be found to occur.

With reference to the relationship existing between the nervous system and the secretion of milk, it may be affirmed that no secretion is so much under the influence of nerve force. It is not improbable that science may hereafter establish a close connection between an attack of parturient apoplexy and the capability of the mammary glands not merely to secrete but to freely effect the formation of the granulated cells of *colostrum*, with which the *first* milk is so largely charged. By their free production, it may certainly be affirmed that fatty matter is effectively and in a rapid manner eliminated from the blood, thus reducing plethora of the vessels and changing the character of the fluid, and probably its action thereby over the entire nervous system.

The influence of *nerve force* upon the amount of the lacteal secretion is doubtless best seen in the human subject, as is that of the character of the *secretion* itself. Dr. Carpenter, in his 'Manual of Physiology,' says, "Under the influence of grief or anxiety the secretion of milk is either checked altogether, or it is diminished in amount and deteriorated in quality. The secretion is usually checked altogether by terror, and under the influence of violent passion it may be so changed in its characters as to produce the most injurious and even fatal consequences to the infant."

I quote this passage chiefly to show the probability of an alteration in the power of the mammary glands in secreting the *first* or colostric milk, as having an important and direct influence over the nervous system, or indirectly upon it through the quality of the blood; this in turn depending upon the amount of fatty matter the circulating fluid contains, or, in other words, on the *quantity of colostrum* which is secreted immediately before or after parturition. It is not difficult to understand how, under such circumstances, the blood and the nervous system can act and re-act abnormally on each other.

So closely attendant on parturition is an attack of the disease, that in a few instances the cow has fallen even before the birth of the calf had been completed. Parturient apoplexy, however, as a rule, occurs shortly after calving, and may happen at any time, as before stated, between the birth of the calf and the close of the fourth day. Why the liability should cease so soon is not easy to determine. It may possibly, as has been hinted at, depend on the excitability of the nervous system being now removed by the mammary glands having eliminated with the lacteal secretion a large proportion of the fatty matter of the blood in the cells of colostrum. In support of this view is the well-known fact that by this time the milk has to a great extent lost the characters of a *colostric* secretion.

Doubtless this theory of the pathology of the disease is open to objection, and so, as it appears to me, is that which fixes primarily the disordered nerve force on the ganglionic nerves of the uterus. It has been supposed that some marked but undefined impress is made on these nerves by parturition, which is quickly conveyed to the cerebro-spinal and cerebral systems. If this be so, it is not difficult to account for the congested state of the vessels of the spinal cord and the brain, of which apoplexy essentially consists. The remarkable suddenness of the attack may also be said to favour the view of the nervous system being primarily and directly impressed. Thus a cow, in all respects in perfect health and exercising her natural maternal interest towards her calf, will be observed to suddenly stagger, fall, and soon to pass into a comatose condition, which ends too often in speedy death.

INDICATIONS AND PROGRESS OF THE ATTACK.—Apart from the very exceptional cases alluded to in which the attack takes place even before parturition, I may here repeat that immediately after her delivery the cow is likely to be affected. The earlier the attack, the more serious does the case become as a rule.

In some instances premonitory symptoms are to be observed; but not in the majority of cases. Indeed it will be found that not only has the cow calved without difficulty, and labour been completed by the expulsion of the fœtal membranes; but that she has yielded a fair quantity of milk, partaken of her food with an appetite, has ruminated, digested, and assimilated it, and voided the fæculent matter in its natural condition, and given every other indication of unimpaired health. Suddenly, however, she is observed to cease feeding, to stagger or assume a fixed position, seemingly conscious that if she attempts to move she will fall. The eyes becomes glassy and amaurotic, and with a bewildered stare she recognises her calf for an instant, moans or bellows, staggers and falls. With mouth half open, tongue protruding, breathing laboured and countenance expressive of intense suffering, she will sometimes make two or three ineffectual attempts to rise. As a rule, however, she remains down and either throws herself on her side, or lies on the belly with the head carried backwards towards the flank, and resting on the floor. The body becomes clammy, the extremities cold, and the evacuations of fæces and urine cease. The pupilary openings of the eyes are dilated, and the vessels of eyelids engorged with blood, tears not unfrequently trickling down the face. Perfect unconsciousness quickly succeeds, or, in medical language, she becomes comatose, and one by one the special senses are lost as well as all voluntary movements.

Coma has been rightly defined to be "that condition in which the functions of animal life are suspended, with the exception of the mixed function of respiration; while the functions of organic life, and especially of the circulation, continue in action. There is neither thought, nor the power of voluntary motion nor sensation."* Thus it will be observed that in the stricken cow the eyes are insensible to the stimulus of light, the limbs to feeling, the ears to sound, and the nostrils to the sense of smell. The taste also and the power of deglutition are gone, the breathing is difficult and stertorous, and the pulse indistinct, wavering and irregular. Besides the loss of swallowing, the implication of the digestive organs in the morbid process is shown by the ingesta in the rumen passing into a state of fermentation, producing that distension of the viscus, termed tympanitis. This condition of the organ is accompanied with frequent eructations, and what is most remarkable in connection with these is the passing of ingesta from the rumen into the œsophagus, its ascent up the tube to the mouth and its descent therefrom into the windpipe, and ultimately into the ramifications of the bronchial tubes. In such cases death depends not directly on the apoplectic state of the brain and spinal marrow, but upon suffocation—asphyxia..

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* Dr. Thomas Watson's lectures on the principles and practice of physic.

The tympanitic state of the rumen, apart from the eructations, adds greatly to the animal's suffering, by impeding the breathing, and thereby adding to the difficulty of the circulation. Exacerbations of suffering are well marked throughout, and are accompanied with spasmodic twitchings, and often with painful convulsions. The cow no longer rests on the belly, but struggles to get on her side, in doing which the head falls heavily on the floor, and generally in a line with the body. No effort on the part of those in attendance can prevent these spasms. Convulsion succeeds convulsion, only to cease with death. Such, in brief, are the symptoms which mark the existence and progress of parturient apoplexy.

The duration of the disease varies, and, as can be readily understood, the recoveries are very few. The majority of the animals are found to sink in twenty to twenty-four hours from the attack. Life is rarely prolonged more than forty-eight hours; indeed it often ceases within four to six hours in cases which are accompanied with convulsions from the beginning.

In some instances the disease assumes a less serious type, and the cow is found to retain consciousness for a short time after dropping, to be followed, however, by coma, usually within the first twelve hours; all the leading phenomena of the malady following in due course. Such cases are none the less fatal on this account; but in the still rarer instances in which the animal does not exhibit a *complete* withdrawal of consciousness the recovery is pretty certain. It would appear that, in such cases as these, the vessels of the spinal marrow only are in an apoplectic condition, those of the brain being congested, but not to engorgement.

Occasionally, however, even in cases in which complete coma is present for twenty-four hours or upwards, the animal has been found to rally. Throughout the attack the cow has lain quiet, convulsions have had hardly any existence, and spasmodic twitchings of muscles have been only slightly marked. Returning consciousness is the most favourable indication of recovery, especially if associated with a temporary recognition of the calf, a desire to partake of water or other fluid, a passing away of the tympanitic state of the belly, and a return of the functions of the bowels. In these cases the warmth comes back to the extremities, the pulse becomes distinct and regular, and the breathing unaccompanied with stertor. The animal soon rises under such favourable conditions, and the secretions—manifestly that of the milk—as well as the excretions are speedily resumed.

Not the least remarkable thing is the rapidity with which a favourable change takes place. We have often left animals, despairing almost entirely of their restoration, and have returned within three or four hours and found them standing with scarcely an unfavourable symptom present. The only explanation which can be given of these cases is that the congested state of the blood-vessels of the brain and spinal marrow had quickly yielded, and a free circulation of the blood been re-established.

POST-MORTEM APPEARANCES.—It may be correctly affirmed that had veterinary surgeons earlier followed up their observations on the symptoms and progress of parturient apoplexy by searching post-mortem examinations, its true pathology would sooner have been recognised. In bygone days it was too much the custom for opinions to be drawn of the nature of almost all internal maladies, simply from the lesions which were to be detected either in the abdomen or chest. In this way we account for the long-existing opinion that parturient apoplexy of the cow was of the same nature as puerperal fever of the human female, viz., that essentially it consisted of inflammation of the uterus and peritoneum. Rarely, however, will it be observed that even the uterus itself presents conditions which would not have been noticed had the cow suffered no illness of any kind, but been slaughtered within the period of calving that the attack usually comes on. Now and then a blush of redness will be seen on its peritoneal surface, limited in extent, and due merely to a hyperæmic condition of its vessels. In no case have we met with diffused inflammation of the peritoneum, nor of the coats of any of the abdominal viscera.

The liver sometimes gives evidence of congestion, and the mucous membrane of the fourth stomach, and also of the intestinal canal, will not unfrequently present here and there a slight inflammatory blush, which owes its origin in most cases to the large doses of cathartic and other medicinal agents which had been administered. Now and then also the omasum—third stomach—will be found to contain an unusual amount of ingesta, which is rather hard and dry; a state of things simply due to coma having impaired its function and led consequently to retention of its contents.

The viscera of the chest are more frequently involved in morbid action; but the pleura cannot be said to give evidence of true inflammation except under peculiar circumstances. The heart, and also the vessels of the lungs, are generally distended with dark-coloured blood, as the result of mere passive congestion.

A most remarkable lesion is not unfrequently met with in the windpipe and bronchial tubes, even to their smallest ramifications, produced by the presence of ingesta which had found its way from the rumen—the first stomach—into the air-passages. In the spasmodic eructations which accompany the comatose stage of the disease, portions of the contents of the rumen—as has been stated in the description of the symptoms—are forced into the œsophagus, and, ascending into the fauces, pass with the tidal air directly into the windpipe. Nothing can more distinctly show the amount of coma which is present than this; for the passage of the ingesta from the fauces through the glottal opening and larynx is unaccompanied with cough or any immediate distress on the part of the animal. In such instances death results from asphyxia, and it may be added that not only ingesta, but even some of the medicine which had incautiously been given—without the appliance of the stomach-pump to secure its conveyance into the rumen—will not unfrequently be found within the bronchial tubes.

As will be surmised from the foregoing observations, the special lesions of parturient apoplexy will be found in the brain and spinal cord. The vessels of both the cerebrum and cerebellum are turgid with blood, and not unfrequently blood extravasations are met with between the membranes of the brain, within its ventricles or on its surface. A similar state of the vessels will be found in the spinal cord, especially in its cervical portion. Here both the turgescence of the vessels and the extravasation of blood are often far greater than in the brain itself. The sheath of the cord participates in the morbid action, and in some instances its vessels, even from the atlas to the lumbar vertebræ, will be found engorged with blood. In one remarkable case examined several years since we found the spinal sheath throughout its full length in such a hyperæmic condition that it appeared as if it had been dipped in a deep red dye. In this case also softening of the cord itself existed in the lumbar region. The animal was attacked twenty-two hours after parturition, and survived only about thirty-six hours. She was prostrate for a longer time before coma became complete than is generally observed in the disease.

In connection with the lesions of the brain and spinal cord mention may be made of a remarkable case which happened to a cow of our own. The animal survived the attack for the long space of 120 hours; and although the coma yielded somewhat during the time, she never became fully conscious, nor rose from the recumbent position. On making a post-mortem examination the upper portion of the sheath of the spinal cord, from its origin to the extent of several inches, was found deeply stained of a red colour, and a considerable amount of gelatinous exudation of serum existed between the cord and its sheath.

Nothing can more satisfactorily prove the true nature of dropping after calving than lesions such as these.

TREATMENT.—It cannot be expected in a disease like parturient apoplexy that curative measures would prove efficacious except in very rare instances. Some practitioners centre all their hopes of cure on being able by a free use of cathartic agents to excite the bowels to increased action. Others rely on unloading the surcharged blood-vessels by blood-lettings; and others again, by the use of stimulants, to rouse suspended nerve force that the blood may thus be driven through the congested and disabled vessels, and the balance of the circulation re-established. Besides these means we meet with practitioners who, regarding the disease as milk-fever, direct their efforts mainly to restoring the lacteal secretion by frequent drawing at the teats. The value of these measures may be said to consist rather in their combination than in their individuality; and it may therefore be said that none of them should be neglected. With reference to the withdrawal of blood, it may be stated that its advantages will depend on the stage of the disease when the animal is first seen. Should the cow be still standing, although supporting the position with the greatest difficulty, or even should she be down, but not yet in a comatose condition, a copious blood-letting should be adopted. If blood be abstracted, it should flow until the pulse wavers from its loss; but if coma should have set in, no justification can be found for blood-letting. We have often known the abstraction of blood in this stage to speedily bring about a fatal termination.

As with the withdrawal of blood, so with the exhibition of cathartic medicine, it should be early adopted. A compound formed of *sulphate of magnesia*, *powdered croton*, *compound tincture of aloes, and a small quantity of calomel*, will be found to be as good as any. The dose should be a powerful one, consisting of three-fourths to a pound of the sulphate of magnesia, twenty to thirty grains of croton-seed, four to six ounces of compound tincture of aloes, and a drachm of calomel; for if an impress can be made on the nerves of organic life by arousing the half-suspended peristaltic action of the intestines, great good will be done. We hold, indeed, that benefit results more from quickening the peristaltic movements than by the mere evacuation of fæces. Still it must be borne in mind that the administration of repeated doses of drastic purgatives is not to be commended, for it frequently happens that, should a favourable change in the symptoms take place, a copious and continuous diarrhœa will set in, which will prove fatal to the semi-convalescent animal, being the result of inflammation of the mucous membrane of the stomachs and intestines induced by the medicine. If any adjunct to the cathartic *first* administered be required, it should consist of enemas often repeated; a stimulating one occasionally, but mainly composed of a bland fluid like soap and water.

We take no objection to drawing at the teats, if not too perseveringly had recourse to, for such a proceeding does, in our opinion, more harm than good, by disquieting the animal by so frequently altering her position to get at the mammary glands. Milking can only remove the fluid from the reservoirs of the glands which had been secreted prior to the attack; and afterwards it can go but little way towards restoring the secretion of the mammæ when coma has set in.

As adjuncts to these means, as well as to others yet to be named, the animal should be thickly clothed, and every effort made to promote warmth of the surface. For this purpose we have known warm *flat-irons*, as used in the laundry, gently passed over the body from time to time, to be attended with advantage. The legs should also be rubbed with a stimulating liniment, such as turpentine and oil in equal quantities, and wrapped in warm flannel-bandages. Sinapisms should likewise be applied to the abdomen. The spine may be rubbed with a stimulating liniment, particularly over the region of the back and loins; but the head should be kept cool by the application of cloths dipped in cold water. To this extent and to no further should the so-called antiphlogistic plan of treatment be adopted. Contrasted with the phlogistic, which consists of the exhibition of stimulating agents even from the commencement of the attack, experience has shown that it is less successful.

We may here state that it is of the first importance, nay, imperatively necessary, that whatever is given either as medicine or as a dietetic agent, it should be administered by the stomach-pump. Before coma sets in, the power of deglutition is impaired, and afterwards it is lost, and even when consciousness is returning it is barely restored. Fluids poured into the mouth will under such circumstances often pass into the windpipe instead of the stomach. Again and again, in making post-mortem examinations, have we found medicine, gruel, &c., in the bronchial tubes, and we repeat that many an animal has been sacrificed—fatal as may be the disease—to a want of precaution in the administration of remedial agents.

With reference to the exhibition of stimulants it must be borne in mind that one of the earliest symptoms after the animal falls is the rapid fermentation of the ingesta in the rumen, producing that distended state of the abdomen before alluded to. This condition of the rumen adds greatly to the animal's sufferings, being accompanied with painful eructations. The gaseous matter evolved from the fermenting ingesta practically consists of carbonic anhydride, to neutralise which ammonia is required. Aromatic spirit of ammonia, in one-ounce to two-ounce doses, with a somewhat larger quantity of tincture of ginger, should be given, and repeated according to circumstances. The tympany may also be relieved, and indeed should be, by occasionally passing the tube of the stomach-pump into the rumen, thus mechanically effecting the removal of the gaseous matter. This procedure will not unfrequently be beneficial in another and no less important way, for by it ingesta will be detected in the œsophagus, which by moderate pressure, as in cases of choking, can be thrust back into the rumen, affording considerable relief to the animal.

The list of stimulating tinctures and mixtures which are admissible is great, and for the most part they may be advantageously mixed with ordinary spirits, such as brandy, whisky, gin, wine, &c. Good wine is to be preferred to spirit, especially in those cases where agents of this kind have frequently to be administered. Its effects are more lasting than those of spirit; besides which much less irritation of the mucous membrane of the stomachs and bowels will attend its repeated exhibition. The agent, however, of the stimulating class which in our hands has proved the most useful is the oil of turpentine. It may be given conjoined with the ethers, nitric or sulphuric, in doses of an ounce and a half every three to four hours for the first sixteen or eighteen hours, should coma continue so long.

Throughout the whole attack the cow must be well propped up with bundles of straw, and kept lying as much as possible on the belly. She should also be *occasionally* moved over from one side to the other. This is of more importance than may at first appear, for by it slight tympany will often be removed; but what is even of greater importance is that stagnation of blood in the parts of the body most pressed upon is thereby prevented. A want of turning has led in several instances to gangrene of the hind-quarters, and ultimately to death therefrom, of animals which had recovered from the comatose condition, had risen and had entered upon the convalescent stage.

From the preceding remarks it will be inferred that medicinal agents will have been employed to their full extent while the condition of the animal demanded their use. On a favourable change taking place, and especially if the cow should rise, recognise her calf and present indications of recovery, no more medicine should be given; but every care and attention be paid to the animal by good nursing and a careful selection of easily digested food.

PREVENTIVE MEASURES.—The great fatality of the disease, notwithstanding the best directed efforts of cure, gives an increased value to the means of prevention, as on them reliance has to be placed for diminishing the number of attacks. The basis on which prevention rests is that of bringing the pregnant animal into as healthy and natural a condition as possible, by the adoption of hygienic and dietetic principles. Cows of a full habit of body or plethoric tendency are, as we have seen, the most predisposed to the disease. To lessen this, restricted diet, selection of food containing less nutritive matter, but good in quality and easy of digestion, daily walking exercise, clean lairage, the occupancy of well-ventilated buildings, and the keeping of the secretory and excretory organs active by the exhibition of medicinal agents, may be said to be among the most effective of these means.

The value of prophylactics, great as it may be, is sometimes diminished by causes over which we seem to have little or no control. This position may be illustrated by the following particulars. For five years, 1838–42, we had under our care a very valuable herd of English-bred Jersey cows—twenty-five in number—among which parturient apoplexy had prevailed to a most serious extent, the annual losses by death averaging not less than 20 per cent. The animals, which were the property of a nobleman, were well cared for, and never allowed to leave the park in which the ducal mansion was situated. Being a so-called self-supporting herd, the annual losses were filled up by the bringing in of the in-calf heifers. We had full authority to use any means thought right for the purpose of preventing the occurrence of the disease, and did not fail to make good use of the privilege. Hygienic principles were adopted throughout the whole period of utero-gestation, and these were added to by the exhibition of aperient and other medicinal agents both immediately before and after parturition. In selected cases bleeding was had recourse to, and, when the state of the mammary glands permitted or required, milking before calving was also adopted. From the time of the birth of the calf till the expiration of the third day a cowman was kept night and day watching the animal, ready to take advantage of the slightest appearance of ill-health by the exhibition of medicine with which he was furnished. As may be supposed, many attacks were avoided and more lives were spared; but it was a remarkable circumstance that, during the five years alluded to, the mortality was never reduced below two a year, or 8 per cent. of the whole herd The saving of 12 per cent. was doubtless a great gain; but it might have been supposed that the disease would have been entirely annihilated by the precautions which were taken.

Statements of the effective prevention of the disease by simply administering aperient medicine within a few days of calving, placing the animal on a restricted and less nutritious diet, and giving a second dose of aperient medicine directly after parturition, are frequently sounded in our ears. Many persons speak as if it were an absolute certainty that the cow would have dropped had not such measures been adopted. It is right to take precautions with every herd; but it must be remembered that thousands of cows in high condition annually produce their calves, even in districts where the disease is common, towards whom no measures of prevention are adopted, and that they pass through labour unscathed. Put these boasted means to the crucial test, as in such herds as we have named, and they will unquestionably fail.

It may be asked, are we then to conclude that parturient apoplexy is as difficult to prevent as to cure? Certainly not; the lives of more cows may, we believe, be saved, by the exhibition of *sedative medicine* immediately on the completion of parturition, conjoined, of course, with the adoption of dietetic and hygienic principles, than by the use of aperients. We quote an instance in point. A dairy of fine Jersey cows, the property of a gentleman, which were always grazed in a park, suffered annually from the malady to a serious extent. Thus, in 1868, out of a herd of sixteen, two died; in 1869, three; in 1870, three, and in 1871, three.

We were then consulted; and suggested that the cows in the latter period of gestation should be supplied with less food, by being kept in the spring and summer for a few hours in the sheds, be regularly exercised, milked if the state of the mammary glands permitted prior to calving, take salines occasionally, such as nitrate and bi-carbonate of potash with the hypersulphite of soda in moderate quantities, viz., from two to three drachms of the nitrate and four to six of the other preparations; and that *immediately on the completion of labour* a full dose of tincture of opium—an ounce and half to two ounces—mixed with an equal quantity of spirits of nitric ether should be administered. The result was even more satisfactory than could have been hoped for, no animal having died since 1871 in the herd from parturient apoplexy.

It is not to be expected that in all cases a result like this will be attained; but we have no hesitation in saying that the system of administering a sedative agent has answered our full expectation, and succeeded far better than any other.

We may add to these remarks one other prophylactic measure, but which would scarcely be carried out to the full extent unless, as was the case in the nobleman's herd, failures continued to occur which it was determined to prevent if possible. The measure alluded to is never to run the risk of a *fourth* calving, but to fatten or sell all the cows in turn after producing their third calf.

We may thus summarise prevention: part with all the old cows; milk late in utero-gestation, and resume it if possible immediately before delivery; enforce daily walking exercise, although the animals may be at pasture; adopt means to lessen the continued supply of rich food; avoid over-repletion of the stomachs after calving; bleed before parturition in cases of plethora; give aperient medicine and follow with salines; keep the animals as free from excitement as possible after delivery, and early administer a full dose of tincture of opium. Other sedatives, such as chloral hydrate, might be combined with the opium, and perhaps with advantage; but of such a combination we have had no experience.

ADDENDUM.

Adynamic Fever.

We append a few remarks on cases in which a pregnant cow drops *prior to parturition*, for by many persons an attack of this kind is viewed as being essentially of the same nature as parturient apoplexy. A close investigation of the circumstances under which the attack occurs, the symptoms by which it is accompanied, and its general result, will show that the affection is altogether of a different nature. The recumbent cow, being incapable of rising until *after* parturition, has led to the belief that the loss of power was due to that form of paralysis termed paraplegia. We do not deny that paraplegia may exist in some cases of "*dropping before calving;*" but these are quite exceptional and of a somewhat different nature. It will be found that in the affection we are considering, paraplegia cannot be present, as both sensation and voluntary motion exist in the hind extremities; that no impairment of the functions of the bowels nor of the urinary bladder is present; that on the completion of the period of utero-gestation, labour-pains come on, and are as powerful and as regular as in an animal which had not dropped, and that the leading symptom, viz., the incapability to rise, is speedily removed when parturition has been effected.

If the term *adynamic* fever be at all applicable to a prostrate cow when pregnant, it would be in these cases. The animal assumes the recumbent position at varying times before calving; but never until the latter period of gestation, when the weight of the fœtus and the gravid uterus, which for many weeks had gone on increasing, had arrived at a stage which the animal is unable to sustain. This may happen even a month before calving, and although at the commencement of the attack indications of febrile action are present, they are not accompanied with coma, nor with any of the ordinary symptoms of parturient apoplexy. Usually within three or four days the febrile symptoms pass off, and the animal is simply the subject of *adynamy.* She lies, feeds well, ruminates, passes the urine and fæces naturally, breathes freely, has no decrease of external temperature, nor any increased pulsatory action of the heart and arteries.

It is not difficult to understand that the muscles of the lumbar region in particular, having to support so great a weight as that of a nearly perfected fœtus, which, when fully developed, we have known to weigh at birth as much as 112 lbs., tire under the strain, and lose to some extent their tonicity, as well as their active power of natural contraction. We refer these cases mainly to such a cause; and it is easy to understand why cows should be affected with adynamy, and mares not, if a glance only be taken of the great length and weakness of the loins of the cow compared with the mare, besides which the spine has to carry the weight of the capacious rumen filled with ingesta, together with that of the other stomachs, bowels, liver and abdominal viscera, in addition to the gravid uterus.

Allusion has been made to cases in which paralysis to a certain extent does exist; and it is easy to understand why such a complication should exist, by looking to the primary cause and consequent diminished power of the lumbar muscles. Impaired tonicity alone would necessarily be associated with weakened nerve force, and may be also with passive congestion, to a certain extent, of the lumbar portion of the spinal cord. Adynamy in these cases is accompanied with indications of febrile action, such as disturbed breathing, increased circulation, loathing of food, suspension of rumination, constipation of bowels, diminished external temperature, and the other usual concomitants of pyrexia. The recumbent position is, however, often sufficient to lessen the severity of the symptoms; but when not, they usually yield to the exhibition of saline aperients, followed by mild febrifuges, warm clothing of the body, stimulating the loins, and well nursing the patient.

Treatment of a similar kind, but not carried to the same extent so far as the exhibition of medicine is concerned, may be demanded in those cases in which congestion of the vessels of the spinal is *not* a necessary complication. Attention to comfort is the main thing here, and above all it should be remembered that under no circumstances must the animal be allowed to lie for many hours together on the same side, but be moved over from right to left and *vice versâ* day by day, that pressure upon the prominent parts of the body, and the now enlarged mammary glands, may not be continuous.

XV.—*Report on Experiments on Anthrax conducted at the Brown Institution, February* 18 *to June* 30, 1878. By Dr. BURDON SANDERSON, F.R.S., formerly Superintendent of the Brown Institution.

IN February, 1878, a very serious outbreak of splenic fever (anthrax) occurred on Mr. Mason's farm at Rigsby, in Lincolnshire, upwards of fifty animals dying in the course of a few days on one farm.

It had at that time already been determined to undertake the inquiry respecting the nature, causes, and prevention of anthrax, and of the diseases allied to it, of which the first fruits have now been presented by Dr. Greenfield. The opportunity afforded by the calamity at Rigsby was therefore seized upon by Mr. Duguid, who was at that time Veterinary Surgeon of the Brown Institution, and had visited the farm as Veterinary Inspector of this Society, of at once beginning the proposed investigation. The records of the experiments, which were made during the succeeding months of 1878, are embodied in the following report. Their value consists in the evidence they afford of two important facts relating to splenic disease. One of these facts is that when the disease is transmitted by inoculation from cattle to small rodents, such as guinea-pigs, and then from them back again to cattle, the character of the disease so transmitted is much milder than that of the original disease acquired in the ordinary way. The rodents die, but the bovine animals inoculated with their blood or with the pulp of their diseased spleens recover. The question whether this fact, like the analogous one of the mitigation of human small-pox by transmission, can be directly applied to a practical purpose, I leave to be determined by future inquiry. Its present interest lies in its bearing on the nature of the process of infection in anthrax.

I attach more practical importance to the second fact which our experiments brought to light, namely, that the poison of anthrax can be very readily communicated by various materials used as food for cattle, and particularly by brewers' "grains." When the warm infusion of this material is once "infected" by the addition of a trace of anthrax poison derived from the body of a diseased animal, the poison so introduced multiplies and grows indefinitely, so that the whole quantity becomes poisonous; and if a drop of this infected liquid is added to a new quantity of infusion, this in its turn acquires similar properties, as may be readily proved by introducing it into the bodies of small animals, such as rabbits or guinea-pigs. In experiments of this kind the "grains" serve the purpose of a nursery or cultivating-ground in which the poison or virus may, as it were, be sown and propagated. We therefore call them "cultivation experiments." Any liquid or material which serves as a suitable soil for the growth and development of the virus may be called a "cultivation liquid." There can be no doubt that when disease suddenly breaks out in a previously healthy locality, as it did at Rigsby, the meaning of the occurrence is that the cattle were in some unknown way brought into contact with an infected "cultivating" material—a soil into which the seed of anthrax had been dropped, how we know not—which was suitable for its development. What this soil was in the case of the Rigsby outbreak cannot be stated. We have reason to be sure that it was not the water which the animals drank, and have no ground for concluding that the particular "grains" on which they were fed were infected.

With reference to the origin of the outbreak of anthrax it is to be borne in mind that the anthrax virus exists in two distinct forms—one in which it is latent, and may remain for years inactive, although capable of being called into activity by suitable conditions; the other, in which it grows and multiplies, as it does in the body of the infected animal. It is known that, in general, infected liquids, such as the blood or tissues of diseased animals, are dangerous only when fresh, losing their specific properties as soon as decomposition begins. But when the material has arrived at a certain stage of maturity, it acquires the power, if preserved from destructive influences, of retaining its virulence for years. I possess a specimen of blood which was taken six years ago from a bovine animal, and was found, when recently tried, to be still virulent.*

I. INOCULATION OF SMALL ANIMALS WITH ANTHRAX BLOOD.

Feb. 18th.—The fresh blood from the spleen of a heifer that died of splenic fever at Rigsby on the night of the 17th was used to inoculate a guinea-pig, which died on the second day after the inoculation, and presented all the post-mortem appearances of anthrax. *Bacilli*[*] were found in the blood from all parts of the body ; but they were most abundant in the spleen, which appeared swollen and tense.

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* Why the anthrax poison is in one state perishable, in another permanent and resisting, is fairly understood by scientific men. The reader who is curious on the subject will find information in Prof. Tyndall's 'Fragments of Science' (vol. ii. p. 282), or in my lectures on 'Infection,' delivered at the University of London in 1878, and reported in the 'British Medical Journal' for January and February, 1878.

From this animal fresh inoculations of others were made, and the first series of the cultivation-experiments attested.

Of the animals inoculated, two guinea-pigs died—one at the end of forty hours; the other was found dead some hours later; and in both bacilli were present in the blood.

In conducting a series of these inoculations from guinea-pig to guinea-pig it was found that they always succumbed to the effects of the poison (when active) in from thirty-six to seventy hours; and in only one instance did the animal survive more than three days. But in several instances the inoculation failed when the animal from which the inoculation material was taken had been dead some time, and decomposition had set in. This was probably the case in two instances, in which blood taken from cattle that died of splenic fever produced no effect on guinea-pigs inoculated with it. Some blood obtained from the spleen of a bullock that died of splenic fever at Rigsby, on March 6th, was introduced into the subcutaneous cellular tissue of a guinea-pig on the evening of March 8th, and only a slight local effect was produced; that the bullock from which the blood was taken died of splenic fever was proved by the presence of bacilli in the blood when examined on the 7th, and the spleen was much enlarged, weighing 14½ lbs. On April 8th blood from a heifer that died of splenic fever on the 6th was used to inoculate a guinea-pig, and produced no result. Similar failures occurred with blood from guinea-pigs that had died of anthrax when decomposition had set in before the material was collected.

The fresh anthrax blood, when spread on a thin layer in a watch-glass and dried quickly at a temperature not exceeding 40° C., retained its activity for weeks; and some of the blood obtained from Rigsby on February 18th, thus treated, was successfully used for inoculations in May. The dried blood from some of the guinea-pigs was also used successfully after having been kept in a dry state for several days.

II. INOCULATION OF CATTLE.

At the time of the first outbreak of splenic fever on Mr. Mason's farm, there were no small bovine animals at the Brown Institution available for these experiments, and therefore the inoculation of cattle with the original anthrax blood could not be tried.

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[*] *Bacillus anthracis* is the name given to the living microscopical organism which is always found in the blood and diseased parts of animals affected with anthrax.

On March 25th the spleen of a guinea-pig that died from inoculation with anthrax blood was triturated in a mortar with a small quantity of ½ per cent. saline solution, and the resulting liquid, containing large numbers of bacilli, was filtered and used to inoculate a calf about six months old. About three drops of the fluid was introduced into the cellular tissue in front of the shoulder, near the course of the jugular vein. On the following day a small nodule was felt at the seat of puncture, but no general symptoms were visible. On the 27th, the second day after inoculation, the temperature had risen from 102° Fahr. to 103°·6. The animal refused its food, and showed well-marked twitching or shivering of the superficial muscles. The temperature still further rose and reached its maximum, 105°·2. On the third day the calf was in a very weak and prostrate condition; when moved it appeared stiff and unable to walk, staggered on its hind legs, and seemed about to fall. These symptoms were accompanied in the later part of the day by diarrhœa, and the animal seemed dying.

On the fourth day the temperature had fallen considerably, the animal was more lively and fed a little; the diarrhœa still continued.

March 30th.—The fifth day after the inoculation the animal was quite well; temperature normal.

As a check-experiment in this case some of the material with which the calf was inoculated was used to inoculate a guinea-pig, which died in about forty-eight hours.

May 7th.—A yearling heifer was inoculated with blood from a guinea-pig that died as the result of inoculation with dried anthrax blood obtained February 18th. In this case the blood was diluted with its own volume of saline solution, and five drops of this mixture were injected directly into the posterior auricular vein.

On the following day the animal was ill and refused its food. The temperature had risen from 101°·8 Fahr. to 103°·2; there was twitching of the muscles and constipation.

The temperature in this case reached its maximum, 106°· Fahr., on the evening of the second day, and from the prostrate condition of the animal it was expected to die during the night, instead of which the temperature declined to 104·2°. The constipation was followed by diarrhœa, and the animal began to take food. On the fourth day the temperature was nearly normal, and the animal fairly well.

At the same time another yearling heifer was inoculated by the introduction of some of the same solution into the cellular tissue; and in this case the symptoms produced were of the same nature, but were less severe, and developed more slowly. The maximum temperature, 105°·2, was not reached till the evening of the third day.

May 16th.—The six-months-old calf inoculated March 25th, and the two yearlings inoculated May 7th, were again used for inoculation with blood from a guinea-pig that died as the result of inoculation with anthrax cultivated to the third generation in grains' infusion.

In the case of the calf, three drops of blood mixed with some saline solution were injected into the posterior auricular vein, and in the two others it was introduced into the cellular tissue.

In the calf the symptoms were very severe; the maximum temperature, 106°·2, was reached on the morning of the third day, and no material decline was noted until the evening of the fourth day. During this time the animal refused food, but showed considerable thirst; was in an extremely prostrate condition, and suffered from diarrhœa. In the other two animals the symptoms were less severe, developed more slowly, and declined earlier.

June 10th.—The same three animals were again inoculated with anthrax cultivated to the third generation in grains' infusion.

In two, the same symptoms were produced as when they were inoculated with the anthrax blood; but in the third animal, from some unexplained cause, no general symptoms followed the inoculation, but a small abscess formed at the seat of puncture.

III. ANTHRAX CULTIVATION EXPERIMENTS.

In the very serious outbreak of anthrax on Mr. Mason's farm at Rigsby, near Alford, Lincolnshire, the affected cattle had been fed on grains brought from a neighbouring brewery; and as this was the only difference between the feeding of the affected and unaffected animals on the farm, it was at first supposed that the grains had produced the disease. Four cattle were fed for several days at the Brown Institution with some of the grains sent up by Mr. Mason for that purpose, but none of them showed any signs of being in the least affected.

The fluid expressed from the grains was used to inoculate some guinea-pigs in the subcutaneous cellular tissue, but the only result was local swelling and the formation of small abscesses at the seat of puncture. Although these experiments gave negative results, it was considered advisable to try whether the anthrax bacillus could live in such a medium as grains, and whether, by inoculation, the grains might be made the means of conveying the poison. For this purpose a small quantity (about 1 lb.) of the grains was thoroughly mixed with one pint of distilled water and allowed to stand for two hours. The liquid thus obtained was filtered and then boiled in a flask, the neck of which was plugged with cotton wool while cooling.

The cultivation was conducted in glass tubes about two inches in length, capable of holding about 1 c.c., the ends of which were drawn out to capillary points. They were filled by breaking off one end under the surface of the liquid. When filled, they were at once inoculated by passing in a droplet of anthrax blood by means of a fine capillary tube, or by introducing a particle of dried anthrax blood on the point of a fine needle. The end was then sealed up, and the tubes were kept for periods varying from two to five days, at a temperature of 36° C. In all these cultivation-experiments a tube containing only the cultivating fluid was placed in the incubator* with the inoculated tubes.

In the first experiment, at the end of sixty hours, fluid from one of these inoculated tubes was used to inoculate two guinea-pigs, both of which died in less than forty-eight hours; and after death the spleen was seen to be large and tense, and the blood was full of bacilli.

As a check-experiment, the grains' infusion to which no anthrax blood had been added was injected under the skin of another guinea-pig, the result being only local swelling and the formation of a small abscess.

A portion of the active cultivated liquid with which the two guinea-pigs were inoculated was added to some freshly-prepared grains' infusion, and the same precautions taken as in the former cultivation, and at the end of three days this second generation of bacilli was found active.

These cultivations were repeated and carried to the third generation from the original inoculation with the anthrax blood, and, when injected into the cellular tissue of an animal, they caused death in about the same time as if anthrax blood had been injected, and after death bacilli were found in the blood of all parts of the body, but most abundantly in the spleen.

Freshly-prepared hay infusion was also used as a cultivating medium, and it was found that the anthrax bacillus could be cultivated in that fluid to the third generation and retain all its virulence, as was proved by animals inoculated with it dying, with all the post-mortem appearances of anthrax, in from forty to sixty hours.

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* The incubator is a chamber in which a temperature a little below blood heat is maintained. Aqueous humour is the liquid contained in the anterior chamber of the eye. It is suitable as a soil for the cultivation of the anthrax virus, because it closely resembles in character the liquid part of the blood.

While the cultivation of the bacillus was being conducted in the grains and hay infusions, some pond-water, containing a considerable amount of organic matter and lime-salts, was tried as a cultivating fluid, but failed. The pond-water was treated in exactly the same manner as the other cultivating fluids, and inoculated with anthrax blood which was known to be active; but at the end of two days, when examined, it was found to contain a variety of organisms, and proved inactive when injected into the cellular tissue of a guinea-pig.

A number of cultivations were conducted in fresh aqueous humour, for the purpose of keeping up a supply of infecting material. This was found a less troublesome and expensive method than the inoculation of a series of guinea-pigs.

In all these cultivation-experiments a portion of the cultivating fluid was sealed up in a tube without the addition of any anthrax blood, and kept along with the inoculated tubes, and when they were used for the inoculations one animal was also inoculated with the cultivating fluid alone, and in no case did it produce more than a slight local effect.

In the course of these experiments several failures had to be recorded, where the liquid supposed to contain the active anthrax poison failed to produce any effect in the inoculated animals; but in all such failures it was found that there were other organisms present, and these were also found in the tube used for the check-experiment, proving that there had been some contamination of the whole liquid during preparation.

XVI.—*Report on an Inquiry into the Nature, Causes, and Prevention of Splenic Fever, Quarter-Evil and Allied Diseases, made at the Brown Institution.* By W. S. GREENFIELD, M.D., F.R.C.P., Professor-Superintendent of the Brown Institution.

THE investigations which form the subject of this Report have been carried on during the past year in continuation of those made in the previous year by Professor Burdon Sanderson and Mr. Duguid. I have, however, extended the scope of the inquiry, and have taken up, in addition to splenic fever, the disease of cattle known as quarter-evil, and the diseases of horses known as Cape horse-sickness and Loodiana fever. Both in the experimental and clinical work I have been most ably assisted by Mr. George Banham, M.R.C.V.S., Veterinary Surgeon to the Brown Institution.

It is necessary to state that the investigation is still in progress, many subjects awaiting further opportunities of obtaining material for examination and experiment; and a doubtful opinion must therefore be expressed on many points, which we hope will be cleared up by future observation.

ANTHRAX AND ANTHRACOID DISEASES.

In addition to the disease of cattle most commonly known to English agriculturists and stockowners as splenic apoplexy or anthrax, there are a considerable number of forms of disease which affect either cattle, sheep, or horses, and more rarely other animals, both in this country and in other parts of the world, to which the common term "*anthracoid*," allied to or resembling anthrax, is applied. Widely diffused as are these diseases, and enormous as is the mortality caused by their attack, we know as yet but little either of their causes or their relation to each other. It was felt that in an inquiry having for its chief object the determination of the causes and prevention of splenic fever, it would be very important to ascertain, as far as possible, the nature of these other forms of anthrax, and the conditions under which they occur, as they might very probably give some clue to the causes of splenic fever.

In England the disease known as Quarter-Ill, Quarter-Evil, Black Quarter, and under many other names, is the one concerning the nature and causes of which the greatest doubt exists.

In France and Germany, and on the Continent generally, the various forms thus separated in England are usually classed together; in France, going under the name of *Charbon*, *Mal de rate*, or *Sang de rate;* in Germany, as *Milzbrand*, *Karbunkelkrankheit* and *Anthrax.* The different forms are sometimes more precisely defined, as I shall show later.

In Russia, the "Siberian Plague" is the name under which the common disease is known, the name having probably arisen from the supposed resemblance of the disease when communicated to man to the true or Levantine Plague. This Siberian plague is very widely spread, reaching throughout Siberia, occurring at scattered spots in Russia, and southwards as far as the Caspian.

In India there are two or three diseases which appear to be closely allied to splenic fever. In the Punjab there is the disease of horses known as Loodiana fever. Elsewhere a similar disease is highly fatal to elephants and camels. The Hara Murree, or Pali Plague, and the Bharsati disease are two other perhaps allied epidemic diseases, concerning the nature of which but little is known.

In South Africa attention has recently been directed to the very fatal disease of horses, known amongst the Boers as throat-sickness, Dikkip, or black tongue. Although presenting many analogies with some of the localised forms of anthrax, it appears to be distinct, inasmuch as true anthrax when affecting horses in the same or other regions is said to present different symptoms. And, as I hope to show, although there are very close analogies in the fungoid organism which is apparently the cause of the disease, there are also certain well-marked distinctions. In the present Report I propose to limit myself almost exclusively to the subject of the experimental investigations which have been made during the past year at the Brown Institution, referring to other points only so far as may be necessary for the purpose of explanation. In a future Report I hope to deal with the more recent observations on the nature and mode of propagation of anthrax, and the more minute description of the morbid anatomy of the several diseases which have formed the subject of investigation.

Amongst the many points relating to anthrax which have received attention, the most important is that of the experimental inoculation of bovine animals with virus modified by transmission through the guinea-pig. Some preliminary experiments made by Mr. Duguid at the request of my predecessor Dr. Burdon Sanderson appeared to show, first, that when anthrax is communicated by inoculation to bovine animals through rodents, the animals so infected, although exhibiting severe symptoms, recover; and, secondly, that such animals are less liable to future infection by the same process than others. These experiments I have repeated, varying the method employed; and although in some respects the results are such as to modify the conclusions suggested by the experiments of Dr. Sanderson, they are nevertheless in striking confirmation of the general result, and afford grounds for hope that the continuance of the experiments may serve to establish a prophylactic for the disease. Hitherto I have had no opportunity of submitting an animal thus inoculated to the crucial test of subsequent exposure to contagion or inoculation from an original case of the disease in a bovine animal; but I have done so from a sheep which died of the artificial disease, with a favourable result.

I have also been engaged in studying the microscopic anatomy of the disease in various animals, with a view to discover the mode of diffusion of the poison, and its method of action in the system, and as some of these investigations afford practical suggestions, I propose to refer to them briefly in the present Report.

Inoculation of Bovine Animals with the Poison of Anthrax transmitted through Guinea-pigs.

It is now a generally recognised fact that the contagium or virus of splenic apoplexy (anthrax) is a low vegetable organism, the so-called *Bacillus anthracis.* This organism is found in enormous quantities in the blood and certain of the tissues of animals dying of the disease. It has been shown by repeated experiment that it may be artificially cultivated outside the living body, under conditions suitable to its growth and propagation; that it nevertheless retains its virulent property, which may be transmitted from generation to generation, so that a far distant progeny of the bacillus first grown from the blood of the living animal, if introduced into the system of another living animal, gives rise to all the phenomena of the disease.

Moreover, the disease is readily communicable to a large number of known animals, rodents being especially susceptible, guinea-pigs and mice being amongst the most easily inoculated.

In transmitting the disease through rodents to bovine animals, two distinct methods may be employed; the one of direct inoculation, the other of inoculation with the cultivated virus.

The direct method, that employed by Mr. Duguid in his experiments, consists in inoculating the bovine animal with the blood or spleen of a guinea-pig which has died of the disease produced either by inoculating from a cow, or from one of a series of which the first was inoculated from a cow. That is, if guinea-pig A is inoculated from a cow, B from A, C from B, D from C, and then a cow direct from D, it would be an example of direct inoculation. Or it might be inoculated direct from A or B or C. Dried blood, if properly secured, retains in parts its infective power for a considerable time, so that this process of transmission may have been carried over some months.

The "cultivation" or indirect method proceeds on the basis of the fact already indicated, that the poison (the *Bacillus anthracis*) may be artificially grown in a cultivating fluid in successive generations, and that the last generation may then be inoculated and produce the symptoms and fatal result of the disease.

Seeing that the object of my experiments was to inoculate bovine animals with a virus modified by its transmission through the guinea-pig, it may appear that it would be desirable, in order to have the full effect of such modification, either to inoculate directly from the guinea-pig or from a cultivation not far removed from it. But there would be many practical advantages, if it were found that, having once transmitted the virus through one guinea-pig or a series of them, its modified property were subsequently maintained in the artificial cultivations. I have therefore kept this in view, and have tested the effect of successive generations of the artificially prepared poison.

It would have been a great advantage if I had been able to test, side by side with these cultivations derived from the guinea-pig, other cultivations derived direct from a bovine animal. But in every case cultivations from the latter have failed, owing to the commencement of decomposition in the material sent to us.

The method of artificial or fractional cultivation is now well-known. The bacillus is capable of growth in many nutrient fluids, amongst others aqueous humour, hay-infusion, serum, urine, and also in many other natural and artificial fluids. The necessary conditions suitable for its cultivation are supply of nourishment and of air, a proper temperature, and the exclusion of sources of putrefaction in the form of germs of other bacteria.

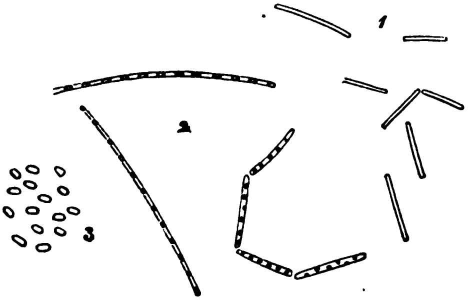
Of the various nutrient fluids, I have employed almost exclusively either aqueous humour or hay-infusion. The former may be readily procured from the eye of a recently killed animal, such as a sheep or ox.

Of the two methods of cultivation most commonly employed, cultivation in cells and in hermetically sealed tubes, I have employed chiefly the latter for my present purpose, as affording a better supply, which can be more easily preserved, and more readily used for inoculation.

The method of cultivation is very simple. A piece of glass-tubing about ¼-inch in diameter is drawn out at both ends to a fine capillary tube, and sealed at the ends. The central chamber thus formed, about an inch in length, is half-filled with the cultivating fluid, after opening the tube; the lower end is then re-sealed; a capillary tube, containing a minute quantity of the blood, or only rubbed on the spleen of the animal which has died of anthrax, is passed down into the chamber till it touches the cultivating fluid; it is then rapidly withdrawn and the tube sealed up. The cultivating tube is then placed in an incubator, which is kept at a uniform temperature of about 35° C., and left there for twenty-four to forty-eight hours, at the end of which time an opalescent mass consisting of the growing bacillus has been formed. From this a minute quantity is removed with a capillary tube, and a fresh tube of cultivating fluid is inoculated and placed in the incubator. And a similar procedure may be repeated for an almost indefinite period, if proper precautions be taken. The bacillus thus grown may be preserved in capillary tubes in certain stages of its existence for a very long time. I may now describe what these stages are, for modern research has shown that this organism passes through several distinct phases of existence, in all, however, preserving its power of germination under suitable conditions, as well as its infective property.

As seen in the blood and tissues of animals dying of anthrax, the *Bacillus anthracis* is usually a short protoplasmic rod, measuring from one to four times the diameter of a human red-blood-corpuscle in length. These rods, in many cases, swarm in immense numbers in the blood, so that they may appear even to exceed the blood-corpuscles themselves in number, and by their presence they interfere with the normal coalescence of the blood-corpuscles and prevent normal coagulation of the blood. But it is not in every case of anthrax that the *Bacilli* present this appearance or are found in such numbers. Not uncommonly they may be found in much smaller quantity; and in some cases examined only four or five hours after death, the rods may be very much longer than those just described. This may possibly be due to growth after death of the animal. On minute inspection, the longer rods are usually found to be in process of division into two or more short rods of nearly uniform length.

Fig. 1.—*Bacillus anthracis.*



1. Rods of *Bacillus anthracis* as seen in the blood. 2. Portions of rods under cultivation. 3. Groups of spores. 1 and 2 magnified about 500 diameters. 3 about 700 diameters.

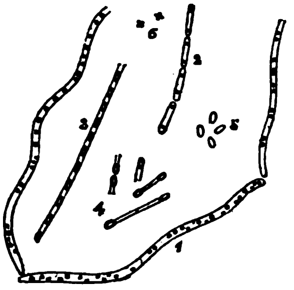
The rods, which appear homogeneous and uniform, and blunt at the ends, increase in number by a process of elongation and transverse fission in the ordinary process of the disease within the body. If one of the rods which is in course of division be watched, it will be seen that having reached a certain length, a clear space appears in the middle between the two highly refractile segments. This clear space does not as yet indicate a complete separation, for a delicate outline can be seen uniting the two rods, which later become entirely separate. This outline is the delicate sheath which surrounds the rods, but is not readily seen during the simple rod stage.

When the organism is cultivated in the manner already described, changes occur which usually follow a certain course. Similar changes may also take place in the carcass of the dead animal, especially if the temperature is favourable.

The short rod elongates rapidly into a long filament, composed of a homogeneous protoplasm enclosed in a very delicate hyaline sheath, and this filament may grow to a great length, curving in all directions and forming loops or spirals. These long filaments are often united in parallel bundles, or cross obliquely in a very characteristic manner.

As this elongation proceeds, changes take place within the substance of the rod which may assume one of two forms. The more common is as follows: The central protoplasmic mass of the rod becomes somewhat granular in appearance, and the protoplasm appears broken at certain points, clear specks, as seen in the lower straight rod of 2, Fig. 1, sometimes appearing at regular intervals. Then the protoplasm shrinks, leaving clear spaces, with ovoid or oblong highly refractile bodies arranged at regular intervals, as at 3, Fig. 2, or more irregularly or in pairs, as at 4, Fig. 2, and 7, Fig. 3. These oblong or ovoid bodies are the now well-known *spores.*

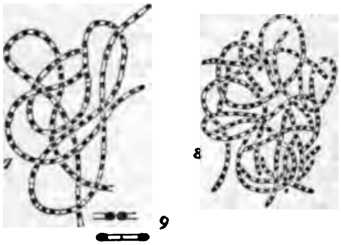
Fig. 2.—*Stages of Bacillus anthracis under Cultivation.*



1. Wavy filament, showing commencing lateral formation of spores, as granular dots. 2. Another part of same cultivation, filament dividing, each segment having a terminal dot. 3. Filament in which spores have formed at nearly regular intervals. 4. Portions of filament with spores after division. 5. Isolated spores. 6. Sporules formed by division of spores.

One of two things may happen: the spores may remain *in situ* in the remains of the filament, which persists only as an almost invisible shred of the external hyaline capsule, or they may escape from the filament by a lateral opening. Or, lastly, the filaments may break up into a number of fragments, each containing one or two spores, as at 4, Fig. 2.

Fig. 3.—*Further Stages of Bacillus anthracis under Cultivation.*



7. Part of convoluted filaments in which spores have formed, and division is commencing in parts, from cultivation of *Bacillus anthracis*. 8. Similar process in another *Bacillus* not connected with anthrax. 9. Portions of filament from 7 more highly magnified.

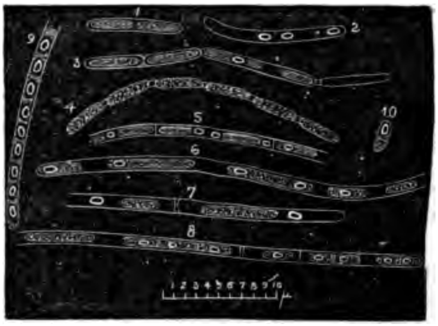
The spores thus formed are capable of long dormancy, for months or years, and may then, given favourable conditions, grow again into rods and reproduce the disease. It is the formation of these spores, and their capacity for resisting changes of temperature and other adverse conditions, which makes the contagion of anthrax so persistent and so difficult to destroy.

In some cases these spores, when kept under conditions which are only favourable to very slow germination, undergo a process of division by transverse fission, each spore first dividing across its length, and then each of these halves divide again transversely, so that each formed a group of four minute bodies, or sporules (as Ewart calls them); as seen at 6, Fig. 2, and still better at 3, Fig. 5.

The other course of change which may occur in the filaments is that seen at 1 and 2, Fig. 2, and at the bent filament in 2, Fig. 1. The filament appears somewhat swollen:—in it (as in 1, Fig. 1) are seen a number of minute bright dots, which as a rule are towards the sides of the sheath, sometimes only here and there, but occasionally crowding the filament with bright oily-looking dots. In some cases the filaments break up into shorter pieces, as at 2, Fig. 2, whilst in this condition. It is probable that this may be regarded as merely a stage in spore formation, which here commences laterally instead of centrally.

The more minute changes which take place in the course of growth and spore formation, will be better seen in Fig. 4, which is taken from cultivations of *Bacillus anthracis*, magnified 1500 diameters.

Fig. 4.—*Bacillus anthracis magnified* 1500 *diameters.*



1. A short rod (8 μ long) in which the protoplasmic contents have divided previous to fi rod. 2. A clear rod containing only spores. 3. A jointed filament composed of three s one of which fission is commencing, in another a spore has formed, whilst anothe 4. Part of filament composed of short homogeneous rods united by a narrower sheath. 5 of long filaments showing various arrangements of the protoplasm and spores. 8. Fr filament in which spore formation is proceeding more regularly. Commencing fissio some parts of the filament. 9. Part of filament completely filled with regularly arrar 10. From another cultivation showing sporule germinating into a short rod.

(It must be stated that the space between the sheath protoplasmic contents did not exist in the original d and that in the other rods it has been necessarily so exaggerated in the woodcut.)

I have thought it well thus briefly to describe the usually observed, in order to render clear the frequent re to these various conditions in describing the experiments

Details of Experiments on Inoculation of Bovine Anim Anthrax poison (Bacillus anthracis) *transmitted Rodents.*

Case I.—A steer, in good health and condition, w under observation for three weeks, in order to ascer normal temperature. It was then inoculated with a smal tity of fluid which had been obtained by cultivation *Bacillus anthracis* in aqueous humour, and which swarm rods and spores of bacillus. The fluid thus used was the generation of the cultivation of spleen of a guinea-pi died of anthrax. This guinea-pig was the third of a through which the disease was transmitted from the inoculation. I have already described the method follo these experiments.

For about twenty-four hours no symptoms were ol there was only very slight swelling at the seat of inoc

On the morning of the second day, *i.e.*, about forty hours after the inoculation, the temperature (in the rectum) was found to be 104° Fahr., the normal temperature having been 100° to 101° Fahr. The animal was drowsy and stupid and fed badly, but no rigour was observed, nor any special symptoms. On the evening of the same day, the temperature was 102·4° Fahr., but on the following day it rose to 106·4° Fahr., and continued to vary between 105° and 107° for three days, during which time the animal was seriously ill, and at times seemed hardly likely to recover. On the eighth day, however, the temperature fell to 104°, and on the ninth to 101°, after which the animal speedily recovered and continued perfectly well.

I was unable to discover any *Bacilli* in a drop of the blood examined, but I do not attach much importance to this fact as any proof that they were not present, for I have often failed to find them in the blood of the general circulation in smaller animals at a period before death, when they must have existed in the blood in some organs.

The animal, having completely recovered, was again inoculated a second time some weeks from the first inoculation. During the interval after subsidence of the fever produced by the first inoculation, the temperature was at no time higher than 101·4°, ranging between 100° and 101°.

This second inoculation was made directly with the fresh spleen of a guinea-pig which had died of anthrax, simply rubbed down with saline solution to make it more fluid. One gramme of this fluid was injected with a hypodermic syringe into the right side about the elbow. The fluid swarmed with rods.

In the evening the temperature was 102°. Next day the temperature was 102·4° morning, and 102·6° evening, and the animal showed some indisposition and took food badly. On the third day there was complete recovery of appetite, and the temperature became normal. The subsequent temperatures will be seen by reference to the appended table. (See page 284.)

The third inoculation was made a week after the second. The animal had completely recovered in every respect, and it was desirable to test the power of resistance acquired by the previous inoculations, and to compare the result with a simultaneous inoculation of another animal with the same material.

In this third inoculation the poison was obtained from a guinea-pig which had died of anthrax derived from the horse. The spleen having been removed shortly after death, was rubbed down with saline solution, and one-half of the fluid injected into the steer, the other half into the cow (Expt. No. 2). No result whatever followed in the case of the steer, with the exception that on the evening of the following day the temperature was 102°. But the appetite was unaffected; the slight local swelling produced by the inoculation speedily subsided.

Fourth inoculation.—A period of three weeks having elapsed after the third inoculation, during which the animal was in good health, a fourth inoculation was made. A guinea-pig, inoculated with blood from the guinea-pig used for a previous experiment, which had been dried and kept in a sealed tube for some weeks, died of anthrax. The spleen was considerably enlarged (an unusual occurrence in the guinea-pig), and very soft, and the fluid exuding from the cut surface swarmed with *Bacilli.* The whole spleen was rubbed down with about a drachm of water, and nearly the whole of the fluid with the particles of the spleen in suspension was injected by means of a hypodermic syringe beneath the skin of the shoulder. The result of this inoculation, so far as general symptoms are concerned, was absolutely *nil*, not the slightest rise of temperature or failure of appetite being produced, and the animal subsequently remaining in perfect health.

Fifth inoculation.—Fourteen days having elapsed since the previous inoculation, during which the temperature of the animal had continued absolutely normal, on no occasion exceeding 101° Fahr., another inoculation was made, the material on this occasion being derived from a sheep, which died of anthrax (see Case IV.). The bloody fluid which flowed from the cut surfaces of the lung was collected, and about one drachm injected beneath the skin of the right shoulder. The fluid injected contained a large number of very long bacillus ·rods, and caused the usual symptoms of anthrax in a guinea-pig inoculated at the same time.

On the day following the inoculation, the part was considerably swollen, the animal was rather dull, and did not take food so well as usual, but there were no other symptoms. There was some rise of temperature—103·4° in the morning, 103·6° mid-day, and 104° evening. Next day there was still some slight loss of appetite, but the temperature was normal, and subsequently the animal continued in perfect health. A slight swelling remained at the seat of inoculation, which subsequently changed into a small abscess. This was opened, and discharged a small quantity of ichorous pus.

This animal is still being kept, awaiting the opportunity of making the crucial experiment of direct inoculation from a case of anthrax in the cow.

CASE I.

EXPERIMENT I.

Day of Observation.	Rectal Temperature.			REMARKS.
	Morning.	Noon.	Evening.	
1	100°·6	°..	101°·	
2	101·	..	101·	
3	101·	..	..	First inoculation with cultivated fluid.
4	101·4	..	101·8	
5	104·	..	102·4	
6	104·4	..	106·4	
7	105·	..	106·8	
8	105·4	..	106·6	
9	106·	..	105·6	
10	104·	..	104·	
11	100·	..	101·	
12	100·4	..	101·	

EXPERIMENTS II. and III.

1	100·	..	101·	
2	100·8	..	101·4	
3	100·4	..	100·8	
4	100·4	..	102·	Second inoculation.
5	102·4	..	102·6	
6	100·4	..	100·	
7	101·	..	101·4	
8	100·6			
9	100·2	..	101·	
10	100·4	..	101·	
11	101·	..	101·2	
12	100·8	..	100·4	
13	100·4	..	101·	Third inoculation.
14	101·2	101·	101·	
15	101·	101·	101·	
16	101·	101·	101·	
17	101·	101·	102·	

EXPERIMENT IV.

1	100·4	..	101·	
2	101·	..	101·	
3	101·2	..	101·6	
4	101·	..	100·6	
5	101·	..	101·4	Fourth inoculation, with spleen of guinea-pig.
6	101·	101·2	101·4	
7	101·2	..	101·	
8	100·4	..	101·	
9	100·	..	100·4	

EXPERIMENT V.

Day of Observation.	Rectal Temperature.			REMARKS.
	Morning.	Noon.	Evening.	
1	101·	..	101·	
2	101·	..	101·	Fifth inoculation, direct fi
3	103·4	103·4	104·	
4	101·	100·8	101·4	
5	101·6	..	101·6	
6	101·2	..	101·6	
7	100·4	..	101·	
8	100·4			

Case II.—The material used for these experiments was d from a case of anthrax in a horse, the poison having been mitted successively through two guinea-pigs. The prepa of the material has already been described (part having used for Inoculation 3 in Case I.).

The other part of the fluid was injected subcutaneously old emaciated cow, which, as was discovered subsequentl in-calf.

On the day of inoculation no symptoms occurred. O following day the temperature rose to 102·4° morning, evening. On the third day the morning temperature was 1 evening 102·4°, but there was no loss of appetite, nor we other symptoms noticed. On the morning of the fourt the animal was found dead.

CASE II.

Day of Observation.	Temperature in Rectum.		
	Morning.	Noon.	Evening.
1	101°·4	101°·4 (Inoculation).	101°·6
2	102·4	102·	103·
3	103·6	102·	102·4
4	Found dead.		

Post-mortem (6 to 9 hours after death). Body emaciate bloody mucous discharge flowed from nostrils and anus.

Stomach full and healthy. Intestines congested, with l extravasation here and there. Spleen somewhat e weighing 2 lbs. 14 oz., presents hæmorrhagic spots in the ca On section, tissue highly vascular, somewhat soft but not di Liver and kidneys apparently healthy.

Heart: numerous small ecchymoses and petechiæ beneath the endocardium, especially that of the left ventricle, and also in the musculi papillares. Some also more deeply in the muscular tissue, and one or two beneath the pericardium.

Lungs appeared healthy and pale.

On microscopical examination, the blood was found to contain very large numbers of rods of *Bacillus anthracis*, and the tissue both of the spleen and the other organs also swarmed with them. The sanious discharge from the nostrils also contained them in great abundance.

The fœtal calf, of about four months, appeared healthy. All its organs were carefully examined for *Bacilli*, but none were discovered.

It will be observed that this experiment differed from the first case in being inoculated direct from the guinea-pig instead of with cultivated fluid, in the original source of the material, viz. the horse, and in the fact that the animal was old and emaciated and in-calf. The latter points appear to me to be of more importance than the former, as the animal in Expt. I. was inoculated in the same way and with the same material without any symptom being induced.

Case III.—A calf 6 months old was inoculated with the fourth cultivation of anthrax *Bacillus*, derived from the guinea-pig. No symptoms whatever were produced. The temperature had been somewhat irregular previous to the inoculation, owing to an attack of diarrhœa. On the ninth day from the first inoculation, the animal appearing perfectly well, it was again inoculated with the first cultivation direct from the spleen, which had been kept sealed up for a fortnight, and swarmed with spores of *Bacillus anthracis.* To test the virulence of the material, a mouse was inoculated at the same time with a very minute quantity, and was found dead the next day, about 20 hours from the time of inoculation. The spleen of the mouse was found to be crowded with rods of the usual character.

On the day following inoculation the part was somewhat swollen, but there was no perceptible rise of temperature until the second day, when it rose to 106° morning, and 106·4° evening. For the ensuing four days the elevation of temperature persisted, with variations from 105·4° to 106·4°, there was continued swelling of the shoulder, which extended, and, together with this, loss of appetite. On the seventh day, the morning temperature was 103·8°, but as the swelling persisted and showed no sign of subsiding, an incision was made into it, and fomentations applied. The subcutaneous connective tissue was found to be infiltrated with colourless, somewhat gelatinous, serous exudation. On microscopic examination no

Bacilli or *Bacteria* were found either in this serous fluid or in the blood.

The animal speedily improved, the swelling subsided, and complete recovery occurred. A sufficient time has not yet elapsed for further inoculations to be made.

CASE III.—CALF SIX MONTHS OLD.

EXPERIMENT I.

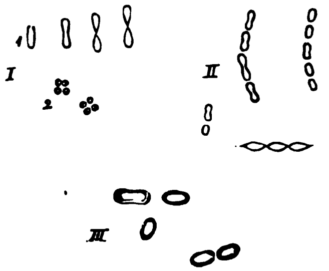
Day of Observation.	Temperature in Rectum.			REMARKS.
	Morning.	Noon.	Evening.	
	°	°	°	
1	..	..	103·	First inoculation, with 4th generation of cultivated material.
2	104·	..	103·6	
3	104·	104·6	105·	
4	103·6	..	104·2	
5	104·	..	103·4	
6	103·	..	103·8	
7	103·	..	103·8	
8	102·	..	103·	
9	103·	..	103·	Second inoculation, with first generation.
10	103·	..	103·2	
11	106·	105·6	106·4	
12	105·4	106·4	105·8	
13	105·4	105·6	105·8	
14	·106·4	106·2	105·8	
15	106·2	..	106·4	
16	103·8	103 8	104·	
17	103·4	103·	102·	Local swelling subsiding. Eats well.
18	102·4	102·	102·	
19	101·	101·2	101·4	Quite well.

Inoculation of Sheep, with cultivated Bacillus anthracis, in the form of Spores.

Some doubts having naturally arisen as to whether the cultivated material used in the preceding experiments could be regarded as representing the anthrax poison in a virulent form, and an opportunity arising for inoculation of a sheep, I thought it desirable to test the material upon this animal. And as the disease is liable to be communicated to sheep, and in some countries frequently forms a fatal epidemic amongst them, the question whether the poison was modified in its action upon them by transmission through rodents appeared important. The following experiment was therefore performed:—

Case IV.—A young sheep was inoculated with a small quantity of the cultivation of the fourth generation, which had been kept sealed up in the incubator for a week. The cha the organisms found in the fluid at the time of inocul seen in the annexed drawing. There were, in fact, ha rods, only spores in various stages of subdivision.

Fig. 5.—*Drawings of Elements seen in Fluid with which the inoculated.*



I. and II. drawn with No. 10 imm. Hartnack, No. 3 oc. 1. Stages of division in s cina-like groups of 4 sporules. II. Rows of spores, some in process of division. III power—spores dividing and divided.

No symptoms whatever were observed, beyond lowering of temperature, as seen in the list of temp (The normal temperature of the sheep averages 10 The animal fed well, and did not appear to suffer in until the evening of the fifth day (96 hours after inoc when the temperature was 107°. No special sympto ever, were observed. Next morning the sheep was fou

Examination of the body about twelve hours after death marked rigor mortis. No trace of decomposition. swelling observed. Skin generally free from exud ecchymosis.

Pleuræ healthy. Lungs pretty fully distended. So patches of collapse in upper part of right lung. Throug whole of both lungs, both on the surface and on section, abundant dark red spots, which have the appearance of u disseminated ecchymoses. They are of nearly unif about that of a mustard-seed. There is no appea pneumonic consolidation around or between them. and trachea contain frothy blood-stained mucus; muco brane generally appears somewhat injected.

Pericardium healthy. Heart: ventricles normally co Some small ecchymoses around the base of the left ven the subserous tissue. Endocardium somewhat deepl stained. Ecchymoses in the muscular wall of the left especially in and around the musculi papillares. healthy. Blood in the heart imperfectly coagulated.

Liver small but natural.

Spleen somewhat enlarged and soft; on section, however, not pulpy, though readily broken down.

Kidneys somewhat swollen and soft, but otherwise of natural appearance.

Stomach and intestines natural.

Brain and cord appear perfectly healthy.

On microscopic examination the blood was found to contain very long rods in comparatively small proportion, *i.e.*, though several were seen in each field, there was no crowding of them together as is often the case. But the rods were of enormous length, many reaching almost the entire width of the field, measuring from ·05 to ·175 of a millimètre in length, or nearly twenty times the usual length, having, in fact, an appearance often found in the bacilli under cultivation, but rarely in the body.

In the bronchial and tracheal mucus, and in the bloody fluid exuding from the lungs, similar elongated *Bacilli* were found.

In the spleen, repeated examination by myself and Mr. Banham, both of the splenic tissue and of the bloody fluid exuding from it, entirely failed to discover any *Bacilli*. Only a few ordinary micrococci were observed, not a single *Bacillus* in any of the specimens examined.

Microscopic examination of the lungs after hardening in chromic acid, showed that these scattered spots were actual hæmorrhages. In addition were seen the usual appearances; *Bacilli* in the capillaries and terminal arteries of the pulmonary system, and also in the interlobular connective tissue.

Day of Inoculation.	Temperatures.	
	Morning.	Evening.
	°	°
1	..	104
2	101·6	103·
3	102·	102·4
4	102·6	103·2
5	103·	107·
6	Found dead.	

I have already described the result of the inoculation of a steer (which had been previously inoculated with cultivated virus from a guinea-pig) with blood from this case. The results produced on the sheep are a striking proof of the virulence of the material after successive cultivations.

To summarise the results of these experiments:—

A yearling steer, inoculated with cultivated *Bacillus* of the guinea-pig, after forty hours had a rise of temperature with local swelling, followed by high fever, lasting about six days, this then subsiding and leaving the animal well.

A second inoculation direct from the guinea-pig was practically without effect. A third with similar material, which killed a cow inoculated with it, was likewise without effect. A fourth, with similar but still more active material, was likewise devoid of effect. And lastly, direct inoculation from a sheep was followed by very slight fever, which passed off without any result beyond a small local abscess. This was the only instance in which such an abscess was found.

A cow, old, emaciated, and in-calf, was inoculated direct from the guinea-pig, and rapidly died of anthrax, having had but little rise of temperature or other symptoms.

A calf, six months old, inoculated with cultivated *Bacillus* fluid, suffered from intense fever, lasting five days, with considerable local swelling, but the temperature then fell, and the animal recovered. The course of the temperature was closely analogous to that in the first case.

It is scarcely safe at present to attempt to draw any very general conclusions from the experiments which have been performed, but I think enough has been done to show the great importance of the inquiry, and the possibility, if not probability, that by this or some analogous method a means may be discovered of controlling or preventing this widely prevalent and highly fatal disease.

It must be evident to any one who considers the matter that there are many points which must be determined by experiments of a much more extensive character than any I am able to carry out at the Brown Institution. If, as I hope, it should prove on further experiment that the earlier results are confirmed, and that the inoculation of bovine animals with the *Bacillus anthracis* cultivated artificially after transmission through guinea-pigs or some other animal serves to render bovine animals totally or partially insusceptible to the disease when transmitted by the usual channels, one great step will have been taken. But there will yet remain the questions: Is the mortality from inoculation by this method a high one, or do even a small percentage of animals die? What are the conditions under which inoculation may be best performed, and does age exercise an important influence in the fatality? And, lastly, for how long a period is protection from attack conferred?

To settle these points, the inoculation of a large number of animals will be necessary, and their subsequent exposure to sources of contagion at favourable periods.

For the present I propose to continue these experiments in the same direction as those which have already been made, varying the conditions in such a way as to determine, if possible, the readiest method of inoculation, and that affording the best results in conferring protection. If the results hitherto obtained should be confirmed, and if I am able to guarantee definite effects from material cultivated in the manner which I have described, it will be easy to preserve the virus for an almost indefinite period, and to send it to any one who is willing to extend the sphere of observation by making inoculations and watching the results.

OUTBREAKS OF ANTHRAX.

There has been but little information as to outbreaks of the disease (splenic apoplexy); and in no case have I had any opportunity of gaining fresh light upon the etiology of the disease. The facts brought to my notice are embodied in the following reports of Mr. Banham; they concern two outbreaks, from which the material for the experiments was derived.

Outbreak near Romford, Essex.—This occurred in October, amongst a herd of twenty-five cows and two bulls. The cows were turned perfectly healthy into a grass field, the subsoil of which is clay. At the lower end of the field is a stream, which carries the sewage from a village about a mile distant. The cows received no other food, they cannot therefore be said to have been highly fed.

In the first outbreak seven cows died. The two bulls, which had been kept in a shed and never been out at all, also died. The only possible communication between the cows and the bulls were—(1) The cows passed the doors of the place in which the bulls were kept. (2) The men who fed the cows often came into the bulls' stables.

The cows were brought up into the homestead, and then allowed to remain for two months, when the owner thought they might be fairly turned out again. But soon after they had been in the grass-field again, two others died. After that they were brought to the farm again, and remained there without any further loss.

The second outbreak occurred at the end of December, at Alford in Lincolnshire. On Dec. 19, 1879, there were twenty-two cows tied up in a shed, and they appeared to be perfectly well when fed at 3 P.M. It may be mentioned that they were fed on barley, chaff, and straw, tares, hay, mangolds, and linseed-cake. At 3.30 one of the cows seemed stupid, and staggered about. The attendant was sent for, and found the animal restless, temperature 109° Fahr., pulse could not be taken. The cow died at 5 P.M. The carcass was removed into a yard where the horses were kept at night, and a post-mortem examination was made there. The most characteristic lesions of splenic apoplexy were found. All the parts with which the cow had been in contact were ordered to be thoroughly cleansed and disinfected. Notwithstanding these precautions, on Dec. 23 a horse, which had been worked the previous day, was found dead. On Dec. 25 another was taken ill, and when the attendant arrived he found it unable to rise, and a frothy hæmorrhagic discharge flowing from the nostrils. Blood was also running from the anus. The visible mucous membranes and tongue were highly congested and studded with hæmorrhagic spots. Death occurred fifteen minutes after his arrival.

In connection with this outbreak, I may mention that in the neighbourhood of Alford the disease appears to be endemic, previous cases having been reported to us.

On a farm in the neighbourhood, the owner lost fifty cattle in February 1878. On June 5, 1879, a yearling steer from the same yard as that in which the previous outbreak had occurred was found dead. A post-mortem examination showed in the abdomen a quantity of black blood; the spleen weighed 8 lbs. and was greatly congested; the gastro-intestinal tract contained bloody fluid throughout, and the mucous membrane showed numerous ecchymoses.

Another case occurred in the same neighbourhood, though at some distance from the above, on June 6, in a heifer grazing in the marsh. No previous case was known to have occurred on this farm for twenty-five years before. The symptoms and post-mortem appearances resembled those in the previous case.

Distribution of Bacilli.—One of the most striking points in the morbid anatomy of anthrax is the enormous number of *Bacilli*, and the way in which they crowd the blood and tissues. One might indeed imagine, from the way in which the blood sometimes swarms with them, that they would be found nearly equally in all the organs. This, however, so far as my observations go, is not the case. Nor are they especially abundant in the spleen in many of the cases which I have examined; in some, *e.g.* the sheep in Case IV., none are found.

In the heart they are often found in very great abundance, crowding the vessels, appearing alongside the vessels in the intermuscular spaces, but not in very great number; and forming here and there masses which completely plug the small vessels and lead to extravasation of blood, which of course also contains *Bacilli*.

In the lungs they are well seen, owing to arrangement of the capillaries in the alveolar walls; but they more rarely lead to infarction.

They do not usually appear in any great number in the pleura.

The liver is sometimes very free from them; when found, they are especially seen in the hepatic veins and their intralobular tributaries.

The kidneys usually contain them in very large numbers, chiefly in the glomeruli and their afferent and efferent arterioles, and in the parts of the vessels in immediate continuity with them. Many of the afferent arterioles are almost completely plugged by masses of them; in the glomeruli themselves, especially near the surface of the organ, they lie in parallel bundles, in such a way that the capillaries appear to be striated; and sometimes they form a mass which may occupy a considerable portion of the glomerulus. I have in some of these masses seen the formation of spores: a fact, I believe, of great importance. Rupture of the glomerulus may occur, and the *Bacilli*, usually accompanied by some blood, escape into the convoluted tubes, where they may grow to a considerable length. Koch states that they do not pass beyond this position, and that he has never seen them in any part of the straight tubes. It must, however, be remembered that he is speaking only of rabbits and mice.

There are many considerations which lead me to believe that either *Bacilli* or spores must, in the majority of cases, pass into the urine and be voided with it; and that this may serve as one of the most important carriers of contagion. I shall therefore consider it a little more in detail. First, with regard to the glomeruli. It is quite possible that after rupture of the capillary network has occurred, and a quantity of blood has been extravasated, very few of the *Bacilli* may traverse the tortuous channel and reach the bladder; but what we know of the passage of blood in the urine, under analogous conditions, leads me to believe that some small quantity must pass. Again, I have frequently observed that individual *Bacilli* can pass through the capillary wall, and even through the walls of large vessels. Some may therefore pass into the urine whilst the network is as yet unruptured.

Again, we know that the urine is an excellent nutrient fluid for *Bacilli*, and that they can go on to the formation of spores. Once escaped, therefore, into the urinary tract, one or two *Bacilli* may serve to contaminate the whole of the urine.

Apart from the glomeruli, the relations of the vascular supply of the pyramids may explain a more direct mode of entry of *Bacilli* by rupture of the capillaries, or, of course, they may escape into the bladder; but the importance of the other method is, I think, especially in the possibility of the acquisition of a more stable form and of spore formation.

Anthrax has been communicated by Feser and others by means of inoculation with the urine of animals suffering from the disease. When we consider the very numerous ways in which the poison thus excreted may, having acquired a stable form, become dried on fodder or hay, or spread on the ground in manure, and subsequently be introduced by various channels into the system, especially of animals which, like cows and sheep, are apt to have their food more or less mingled with excreta, we need seek for no more ready mode of preservation and conveyance of the contagion. This fact, if it leads to more rigorous sanitary precautions (such as the thorough destruction of all litter, &c.) suggested by these observations, may prove of great value in limiting and controlling the disease.

The widespread distribution of the *Bacilli* in the capillaries of all the organs which are concerned in the most important functions of animal life, is suggestive of other modes by which they may cause death than by their direct action on the blood. Unquestionably, they must interfere with oxygenation, by taking from the red corpuscles their needful amount of oxygen and appropriating it to their own growth; but their mere mechanical effect must also be considered, impeding, as it must, the action of the heart, the circulation and air absorption in the lungs, the excretory functions of the intestines and kidneys, and so on of nearly all the organs. And in corroboration of this view are the often observed facts of preservation of intelligence and some power of action till very shortly before death, of the lowered temperature which often precedes death, and of the absence of the ordinary symptoms of septic poisoning, properly so-called: the defective coagulation depending on the mechanical presence of *Bacilli*. So far as I have seen, there may be but slight changes in the blood taken from a large vessel, whilst the capillaries of the organ are crowded with bacilli, and the phenomena associated with early decomposition are much less frequent than in many forms of blood-poisoning.

QUARTER-EVIL, BLACK QUARTER, OR BLACK LEG.

The disease commonly known by these names is usually regarded as one of the forms of anthrax. It is widely spread throughout this country; and different names are used to designate it in different counties. Quarter-Ill, Joint-Ill, Quarter-Felon, Speed, Hasty, Puck, or Pook, Schewl, and Inflammatory Fever, all appear to be merely local appellations for the same disease. A similar affection is described as *Erysipelas carbunculosum* (Armitage), *Emphysema infectiosum* (Böllinger); and in Germany it would appear to be classed as only a variety of anthrax, as "Milzbrand Karbunkel," or "Milzbrand Emphysem," and "Rauschbrand." In France the corresponding form is called "Œdème charbonneuse," or "Œdème malin." But I cannot positively assert that any of these names indicate a disease identical with Quarter Evil.

Although the disease is well-known to most stock-owners, and in many parts of the country occurs with great regularity at certain periods of the year in some pastures, it is desirable that I should mention the principal common features of the disease under consideration, in order that no confusion may arise. This is the more necessary, as most authors do not separate this disease from anthrax, but consider it is only one manifestation of that disease. I shall point out that there are certain differences from anthrax, in the conditions of its occurrence, its mode of apparent spread, and its pathological appearances, which are sufficiently marked to suggest a provisional separation from anthrax.

For many of the facts with regard to this disease I am indebted to my colleague, Mr. Banham, who has seen a good deal of it in Cambridgeshire.

The animals usually affected are cattle under two years of age. Young sheep are occasionally victims to it.

It occurs chiefly at certain periods of the year, especially the spring and early summer, though not by any means necessarily limited to that time, cases sometimes occurring in October, and its chief prevalence is amongst young cattle recently put out to graze. In some districts there are certain pastures, even certain fields or paddocks, in which cases occur regularly year after year, whilst in other fields cases never break out. So far as the information received extends, these pastures are commonly low-lying lands, with defective drainage, clay and calcareous soils being especially favourable to its development.

Whatever the cause of the disease, it would appear, if infectious at all, to be so only to a very slight degree. In some places cases occur sporadically year after year, only one or two animals dying, and the others remaining perfectly healthy, removal from the field to another being the only precaution required. Sometimes a number of animals succumb, but it rarely extends beyond one farm or one lot of stock.

The first symptom observed is that the animal isolates itself from the herd, lies down, shivers, refuses its food, appears dull and listless, and there may or may not be symptoms of fever. The pulse is irregular, feeble, and rapid, 80 to 120 per minute; if fever is present, the mouth is hot and dry, the conjunctiva reddened, and sometimes spotted with petechiæ. Some small swellings appear, either on the loins, back, neck, head, brisket, or on one or more of the limbs (usually on the shoulder or quarter). These swellings are at first hot and painful; they rapidly increase in size, and then become cold and painless, and form diffused emphysematous swellings, occupying an extensive surface, which, when tapped with the fingers, produce a peculiar crepitating sound, and if cut into, dark frothy bloody fluid exudes. Large surfaces are frequently found in this mortified state without being preceded by smaller carbuncular swellings. Lameness is of course, in these cases, a prominent symptom. The animal usually lies in this condition for from six to eight hours, then becomes stupid and unconscious, and finally dies in a comatose state.

The course and duration of the disease vary; cases have been known to live from three to seven days, and it is stated by Röll that the swellings sometimes break at one or more points, discharging a gangrenous, ichorous, or tenacious bloody fluid; and it is said that the animal may recover, but Mr. Banham says that these cases are rare, if they ever occur, in England. Most commonly the disease runs a quick course, and kills the animal in from twelve to fifteen hours.

The usual post-mortem appearances are: Rigor mortis only slightly developed, the carcass greatly swollen, owing to the subcutaneous emphysema, and also, in some cases, to tympanitis. The blood extravasations are usually confined to one quarter, but they may be found in any part of the body. The blood is usually dark-coloured, fluid, and imperfectly coagulated, and, according to some authors, it has a peculiar odour. Decomposition sets in very rapidly, and the blood soon swarms with bacteria.

The lungs are said to be congested, the bronchi often filled with frothy mucus. The spleen is usually of normal size and consistence, the liver of healthy appearance, the intestines sometimes containing ecchymosed spots, but usually healthy.

But the most striking changes are found in the affected limb or quarter. The integuments are distended by the swelling of the subcutaneous tissue. On cutting through the skin, a large quantity of blackish, almost tarry, frothy fluid, filled with bubbles of gas, is found in this position. The swelling and gangrenous condition are not limited to the subcutaneous tissue, but extend deeply through the intermuscular planes separating the muscles. The muscles themselves are of blackish-red colour, mottled with points of ecchymosis, and there is a similar œdema of the connective tissue between the bundles of muscular fibres, which separates the individual bundles, in a manner analogous to that in which the exudation in the lung in pleuro-pneumonia of cattle separates the pulmonary lobules.

The diseased quarter is said to be very deadly to pigs and dogs, and it occasionally happens that men who dress the carcass, if scratched, die very rapidly with a peculiar form of blood-poisoning; yet it is stated to be a common practice to cut off and bury the affected quarter, and to cook and eat the rest, without any known ill-effects.

By some authors * the disease is divided into two forms, the one affecting the quarter, the other chiefly involving the intestines. In the latter form the chief symptoms are the passage of bloody fæces with tenesmus, occasionally, also, the urine being bloody; great tympanitic distension of the abdomen, and rapid prostration. The mucous membrane of the intestines is greatly swollen and intensely congested, or almost gangrenous; they contain soft bloody fæces. This is most marked in the large intestine. The mesenteric glands are greatly swollen, congested, and softened, and contain hæmorrhagic spots. There may be bloody exudation in the peritoneum.

This form of the disease appears to be somewhat allied to the so-called *Mycosis intestinalis.*

It may be well here to point out certain features in which the disease usually differs from splenic apoplexy.

1. Its limitation to certain localities and certain periods of the year, and the apparent absence of direct contagion in most cases.
2. The gangrenous emphysematous nature of the swellings, which is not usual even with local forms of anthrax.
3. The general course and long duration of the disease in some cases.
4. The presence of coma and convulsions for some time before death.
5. The absence of swelling of the spleen.
6. So far as most observations go, the absence of the characteristic anthrax *Bacillus* from the blood.

And, as I shall further show, the disease may be exactly reproduced in rodents by inoculation from various parts of the body, without the discoverable presence of anthrax *Bacillus* in the blood or organs of the inoculated animals.

On the other hand, in no inoculation have I succeeded in producing anthrax, even in animals very highly susceptible of infection by its poison in very minute doses, such, for instance, as mice and guinea-pigs.

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* A full account of these diseases is given by F. Hable in the 'Oesterreichische Vierteljahreschrift für Wissen. Veterinärkunde.' Bd. li. H. 1, which has been translated by Mr. Banham.

There has been great difficulty in procuring any material from this disease for investigation and experiment, only two outbreaks having been reported early enough to allow of a personal inspection. In two or three cases specimens of blood from the affected quarter, or from the jugular vein, and of other fluids, have been forwarded, but in every case the material had not been properly secured from sources of decomposition, and proved inert on inoculation, showing that in this, as in many other diseases, the specific virus is destroyed by decomposition of the fluid containing it.

The most satisfactory case was one in which Mr. Banham was able to make a post-mortem examination and to secure specimens of the various fluids and tissues of the body at a sufficiently early period after death for examination.

In October 1879 an outbreak of Black Quarter occurred in the parish of Madingley, a village about three miles from Cambridge, in a herd of ten or twelve young animals, four of which succumbed to the disease. The usual prophylactic treatment, viz. change of pasture and food, with the administration of saline purgatives followed by vegetable tonics, was adopted, and the other animals remained perfectly healthy.

Mr. Banham states that most of the land in this district has a loamy upper soil, with a clayey subsoil, and in consequence the water remains on the land for a considerable time, making it very "clung" and hard to work, what is commonly called "heavy" land.

Through the kindness of Mr. Page Wallis, of Cambridge, Mr. Banham was enabled to make a post-mortem examination of the last of the animals which died during the outbreak, twenty hours after death, and I examined the tissues and fluids about five and a half hours later.

Mr. Banham's report of the post-mortem examination is as follows:—

"The carcass was extremely emphysematous, the subcutaneous tissue more or less distended with gas, and infiltrated with reddish gelatinous fluid, this condition being, however, much more marked on the right shoulder and hind quarter, the left side of the body being less affected. On removal of the skin, the muscles beneath the places most affected with emphysematous swelling were of a dark colour, and infiltrated with frothy, gelatinous, dark-coloured fluid. The muscles most affected were those surrounding the left humerus, both tibiæ, and the right lumbar region and shoulder.

"Abdomen tympanitic, and, when opened, a quantity of red-coloured fluid escaped from the cavity. The stomach and intestines appeared healthy. The spleen was slightly enlarged and softened. Liver normal to the naked eye. Kidneys of natural size and colour.

"Pleuræ contained an unusual amount of fluid, serous membrane smooth and glistening. Lungs fairly healthy, except at the lower third of the left lung, which appeared airless, or nearly so, firm, of dark-red colour and sank in water (probably collapse). Heart and pericardium healthy. Blood in ventricles of heart had coagulated to a firm clot. Similar coagulation had taken place in the large veins."

Blood from the heart and jugular vein and spleen, serum from the heart and from the affected quarter, were preserved in capillary tubes hermetically sealed, and examined by myself about five hours later, with the following results:

The *serum* from the affected parts contained only a very few rods, and some few spores similar to those found in other parts. The serum from the blood of the heart contained very few red corpuscles, but in it were seen scattered spores and pieces of filaments attached to them. These spores were nearly 1·4 μ in length, and about ·6 or ·7 μ in diameter, hence they were much larger than ordinary bacteria.* The filaments attached to some also resembled pieces of the ordinary anthrax bacillus rods, they were of very delicate outline.

The spleen was found to contain a very large number of oblong spores, some free, others with pieces of the filaments attached to them.

From these fluids animals were inoculated with the following results.

Experiment I.—A guinea-pig, inoculated at 12 P.M. Oct. 9, with fluid from the spleen, was found next evening, twenty hours after the inoculation, to be apparently paralysed in the hind limbs, with extremely low temperature. There was swelling and emphysema of the walls of the abdomen, and of the tissues of the inoculated limb. It was killed at 9 P.M., and the tissues and fluids at once examined.

The skin of the thigh and of the adjacent abdominal wall was found to separate very readily; the whole of the subjacent tissues being of blackish, almost gangrenous, appearance. The muscles of the thigh and abdomen were also swollen, of very black colour, and contained numerous ecchymoses. The spleen appeared perfectly healthy, and not apparently enlarged.

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* It must here be mentioned that *Bacilli* may be found in blood and tissues after death, which are not anthrax *Bacilli.* The proof of their anthracoid nature is found only in their effect when inoculated in another animal. This point is too complicated for discussion here. For some facts I may refer to a work of Dr. Timothy Lewis, in 'Microscopic Organisms found in the Blood of Man and Animals,' p. 41. Calcutta, 1879.

On examining the serum from the swollen connective tissue of the thigh, it was found to contain ordinary bacteria and micrococci, the bacteria in very active movement. Serous fluid, which was somewhat blood-stained, obtained from the centre of affected muscles, also contained a few moving bacteria of the common form. The blood from the heart appeared to be perfectly healthy, and contained neither bacteria nor micrococci of the ordinary form. That from the spleen swarmed with bacteria and micrococci, a few of the rods being quiescent, but even these having the form of ordinary decomposition bacteria. The lungs appeared perfectly natural. I could not collect any fluid in the serous cavities.

In this case, then, there were none of the usual characters of anthrax, and neither bacillus rods nor spores were to be discovered in the spleen or tissues; but there are two noteworthy points, viz., that the emphysematous swelling of the inoculated limb and of the abdominal wall, the almost gangrenous state of the tissues and the black condition of the muscles were present, reproducing in this respect the clinical features of the original disease. At the same time there was evidence that decomposition had already commenced during life, in the fact that the splenic tissue swarmed with bacteria. I have never found this before in an animal killed and examined at once. In the other inoculations I was unable to examine the tissues immediately after death.

Experiment II.—A guinea-pig, inoculated in the leg with serum from the affected quarter at the same time as the preceding, was found dead at 8·30 A.M. on October 11. I was unable to examine the body till 5 P.M. The whole of the quarter where the inoculation was made was greatly swollen, the hair and epidermis were detached with great ease, even by a slight touch. In the subcutaneous tissue of this limb and over a great part of the abdominal wall was a quantity of deeply blood-stained exudation. The muscles of the thigh were swollen and black, containing small spots of ecchymosis. The other hind limb was not affected. All the viscera and the serous cavities were apparently perfectly healthy, and the spleen was free from enlargement.

The blood-stained serum from the subcutaneous tissue contained many red blood-corpuscles, a few ordinary moving rod-shaped bacteria and some micrococci, no still rods or spores. The peritoneal serum contained no bacteria at all, nor did the blood from the heart. In the spleen were found only ordinary moving bacteria. In the pleural serum were a few longer moving rods, some measuring from 8 to 12 μ in length, showing signs of incipient division, but not containing spores.

Experiment III.—Another guinea-pig was inoculated at the same time with blood from the heart, which, it will be remembered, contained spores resembling anthrax spores, and was also found dead thirty-three hours after the inoculation, having had a temperature ten hours after of 106°, and in the evening, twenty-two hours after inoculation, of 100·4°. The appearances, both naked-eye and microscopical, were precisely similar to those in the preceding: no *Bacilli* nor definite spores were found.

Experiment IV.—A rabbit, inoculated in the leg with fluid from the spleen, presented on the following day a very marked swelling of the whole of the inoculated limb, much resembling that in the guinea-pigs. The temperature was 104° for the next two days, morning and evening; on the third day it was 103° to 103·4°, on the fourth, 102·8°. The swelling gradually declined and the animal recovered. These experiments were not continued further, for at the time they appeared to me to indicate that the material employed must have been too much decomposed to be of value. But on reconsideration I am inclined to think that this may have been an error.

In all four of these experiments the sequel was different, both from that of the inoculation of ordinary septic material, and from that containing anthrax *Bacilli*. In all there were the peculiar emphysematous swelling and the black condition of the muscles, with ecchymoses scattered through them, which are characteristic of and give the special feature to the disease known as black-quarter. In no other experiments with animal fluids have I seen anything at all similar produced. Moreover, it was produced alike with the blood from the heart, juice expressed from the spleen, and the serous exudate from the affected quarter.

I would especially notice the fact that the spores found in the spleen gave no signs of growth; that they were, in fact, not reproduced in the slightest degree in the animals inoculated. Now what has commonly been observed is that if material containing a quantity of anthrax spores is inoculated, anthrax *Bacilli*, being developed more rapidly in the body than other *Bacilli*, produce the symptoms of splenic apoplexy. Here we have evidently to deal with a poison equally rapid and fatal in its action in some cases, producing decomposition actually during life, but apparently hindering the development of *Bacillus anthracis*, if that organism is really present.

Some other experiments, previously made, show that the blood of quarter-evil loses its peculiar properties when decomposition has become at all advanced, indeed that, as has been shown to occur in many cases, such blood may be inoculated in rodents without causing any deleterious effects at the time, though in some cases later effects are developed.

Some blood taken six hours after death from the jugular vein of a cow which died of black-quarter on June 24 was received by me on June 28. The blood had been placed in a small stoppered bottle, completely filled and well secured; nevertheless when received it was highly offensive. It contained only a few common rod-shaped and other forms of bacteria. About four minims of the blood were injected under the skin of the thigh of a guinea-pig. It was gradually absorbed, the animal showing no symptons whatever. About one drop was similarly injected beneath the skin of the back of a mouse, and no results were produced.

Another outbreak, which occurred near Cambridge, has given further opportunities for investigation of this disease. Two cases being reported on February 24, 1880, Mr. Banham went down to Cambridge to examine them and procure material.

He found that a post-mortem examination had already been made, and only the affected quarters reserved for his inspection. Nothing abnormal was found in the internal organs. In both cases the affected quarter presented in the most striking manner the usual characters, which have already been described, the subcutaneous and intermuscular connective tissue being infiltrated with blood-stained serum, and the muscles of blackish-purple colour mottled with spots of hæmorrhage.

Blood and serous exudation from these parts were secured in capillary tubes about twenty-four hours after death, the weather being cold and almost frosty in the interval. On examining these fluids about thirty-two hours after death I found no sign of decomposition. In the blood and the blood-stained serum which flowed from the quarter, the only striking fact was the entire absence of coagulation, the blood-corpuscles remaining entirely isolated. I was unable, with the highest power which I had at hand ($\frac{1}{12}$th oil-immersion of Zeiss), on prolonged examination to detect any bacteria of any form whatever, even micrococci being absent in the freshly-opened tubes containing only blood. No traces of *Bacilli* or their remains were discovered. It is the more remarkable that bacteria should have been absent, as it is not uncommon for the blood and tissues of the affected parts to be found in a state of decomposition directly after death, sometimes even during life as we have already seen.

Inoculation experiments were made with the blood and serum from the affected quarter, as in the preceding case.

Experiment I.—A rabbit was inoculated in the thigh with a drop of the serous fluid which had been collected. No symptoms or local results followed.

Experiment II.—A rabbit was inoculated with 2 minims of bloody fluid (chiefly blood) from the affected quarter. No symptoms, either local or general, ensued.

Experiment III.—A guinea-pig was similarly inoculated with the blood. No effect was produced.

At first sight these experiments seem to contradict the results obtained with the previous case. But I must point out a striking difference in the method employed, or rather in the material used. In the former case most of the results were obtained by inoculation with either the spleen or the blood from the general circulation, inoculation with which gave rise to the local phenomena of the disease. Moreover, all the fluids used contained bacteria of some form. In the present case only the local serum and blood were employed, the other fluids not being obtainable, and no bacteria could be discovered in the fluids inoculated. It would, therefore, appear probable that the specific virus does not reside in the local lesion, or is present in a far less active form there than elsewhere. And this again would appear to suggest that the affection of the quarter or limb is secondary to and not the cause of the general disease.

I do not desire to speculate further on this subject, which can only be solved by further experiment. Two conclusions alone appear to me to be warranted. First, a scientific one, that the disease must be different from anthrax, which is so readily communicable to lower animals, especially rodents, that if this were a form of anthrax, some of our experiments must have produced that disease, instead of reproducing either the identical quarter-evil or no effect whatever. Second, a practical conclusion, that the danger of infection is as great or greater from the unaffected parts of the body as from the obviously affected and gangrenous quarter. The practice of burying or burning the obviously diseased part only, and taking no steps to destroy or disinfect the rest of the carcass, is therefore clearly fraught with danger to other animals.

I reserve for a future occasion the description of the microscopical examination of sections of the hardened organs of animals dying of the original disease, and as a result of inoculation from it. I may, however, state that the principal results of this examination were to establish the identity of the inoculalated with the original disease, and to confirm the conclusions drawn from the naked-eye appearances, but beyond this they have not afforded any clue to the pathology of the disease.

In connection with the experiments on this disease it is right that I should mention the following observation, made in their course. That flagellated protozoa may exist in the blood of healthy animals is now well known from the observations of Rättig, Wedl, Lewis, and others. But I am not aware of any similar recorded observation, and it may be found to have a pathological bearing at some future date.

An apparently healthy white mouse was inoculated in the tail with some blood from the diseased quarter, and as it presented no symptom beyond some swelling of the tail, it was supposed to have escaped all mischief. However, the swelling did not subside, but became gangrenous, and towards the middle of the second week it began to emaciate and the belly swelled; finally, it died on the fourteenth day after the inoculation.

Examination five hours after Death.—On opening the abdomen there was found to be considerable opalescent exudation in the peritoneum; the abdominal wall was also swollen and infiltrated. The tail, where inoculated, was considerably swollen. The other organs were fairly healthy. Before, however, I examined the organs, I took, as usual, some of the exudation in capillary tubes, and also some serum from the pleura and pericardium, and examined these microscopically.

I naturally anticipated that I should have found the ordinary characters of semi-purulent serous effusion in the peritoneal fluid, but my astonishment was great when I found the fluid to be swarming with minute organisms swimming actively about in every direction, moving apparently by means of two long cilia or flagella.

These organisms I may now describe more fully. They were ovoid, rounded, or more commonly, when in motion, pyriform or balloon-shaped; very translucent, of delicate hyaline structure, sharply defined. At the posterior extremity were two long fine lashes, moving with a wavy motion, much like that of cilia, and apparently serving to propel the organism forwards. In each could be seen a central clear space running lengthwise, wider at its central part, and apparently contracting and expanding. At the anterior extremity a more refractile part could be seen, apparently forming a sort of oral aperture. Their protoplasm was highly contractile, and they changed shape, elongating and contracting very readily. In size they were, when at rest and round, about from 2 to 4·5 μ in diameter; when elongated, some reached 6 μ in length, and 1·5 to 2 μ in width. I was able to observe their movements for more than half an hour, but it was not until they were quiescent that the other cilia could be seen, and they were not well seen until stained. A more thorough study of their character was possible after staining with methylaniline violet, and mounting in glycerine jelly. It was then found that they had each at least six lashes, sometimes apparently eight, two of these being at the caudal extremity, and the remaining four attached to the anterior extremity, and, so far as I could see, around the oral aperture. These cilia or flagella were extremely delicate, so as hardly to be visible without staining. In length they were from 5 μ to 8 μ, or nearly twice as long as the length of the body. After staining, the body of some presented numerous fine granules, perhaps due to coagulation of the protoplasm; in each one the anterior extremity stained more deeply, and in some formed a distinct ring. In all the central space came out very clearly.

There can, I think, be little doubt that the anterior cilia were not visible during life, owing to their very active movement; that the posterior, which seemed to propel the body, were really serving rather as rudders to steer it.

I supposed at first that these might be parasites which had escaped from the intestine, bladder, or elsewhere, and I therefore examined very carefully the contents of these viscera throughout their whole extent, and also the blood, &c., but failed to find any trace of similar organisms in any of these; whilst all the specimens from the peritoneal exudation swarmed with them, and contained no other organised constituents of importance.

What is their nature and significance I must leave for future observation to discover.

OTHER ANTHRACOID DISEASES.

Amongst the diseases of the class of blood-poisonings which appear to be allied to anthrax are two which especially affect horses, and are known respectively as Cape Horse-sickness and Loodiana fever. At present it is uncertain whether these are identical, and also whether they are or are not produced by the same poison as anthrax.

The former disease, "Cape Horse-sickness," is one to which attention has been specially directed of late by the Zulu war. It appears to be endemic (or enzōotic) in certain regions, notably of Natal and Zululand, occurring chiefly in low-lying lands and in valleys, though cases sometimes occur at high altitudes. The disease usually prevails at particular seasons of the year, especially in moist hot weather, or when rain occurs after heat, disappearing almost entirely both in hot dry weather and also in the cold season. Almost universal popular belief and recent experience attribute the attacks to eating the wet grass under such conditions, and it has been observed that cases are especially prevalent when horses are allowed to graze on, or are tethered out, in wet grass.

The onset is usually sudden, with dulness, loss of appetite, rise of temperature, injection of the conjunctivæ, accelerated breathing, cough, and other symptoms, resembling those of inflammation of the lungs. There is evidence of considerable exudation in the bronchi, and in some cases a large quantity of mucus is discharged from the mouth and nostrils. The temperature is usually considerably elevated, reaching 105° to 108° Fahr. In one form of the disease there is great swelling of the tongue and of the cellular tissue of the throat, causing death by suffocation.

The disease is usually fatal, sometimes in a few hours, more rarely in two or three days, and cases of recovery are on record.

The post-mortem examination shows usually rapid decomposition. There is often a quantity of straw-coloured fluid in the pleura; the lungs are engorged, and along the margin and in patches beneath the pleura is a large quantity of yellow lymph. On section of the lungs, blood and serum flow freely from the cut surfaces, and frothy yellow mucus from the bronchi.

Ecchymoses are invariably found beneath the endocardium of the left ventricle, the heart is soft and flabby, and there may be serous effusion in the pericardium.

The following account of a case of this disease, for which I am indebted to Mr. R. Moore, M.R.C.V.S., gives a good illustration of the symptoms and post-mortem appearances which are usually observed. Material was sent to me for examination:—

"The horse had been doing very little work, and was in good condition. He was noticed to be dull in his work the day before he was taken ill. He was first noticed to be ill at 3 o'clock P.M., and was seen by me at 6 o'clock the same evening, when he was presenting the following symptoms: Temperature at the mouth very high; pulse imperceptible; visible mucous membranes highly congested and of a livid hue, especially round the gums; breathing very laborious; extremities and surface of body cold; crepitation in all parts of both lungs on auscultation. At 9 P.M. the characteristic discharge of froth issued freely from the nostrils, and he expired about 10 P.M.

"*Post-mortem Examination.*—Body in good condition; flesh dark in colour.

"*Chest.*—Large accumulations of lymph in patches in the areolar tissue on the surface of the lungs and pericardium. Both lungs large in appearance, but not of a very dark colour. When cut, they presented great capillary congestion, which pervaded every inch of the lungs. The bronchial tubes, both large and small, were very much congested, and from them issued the froth. No part of the lungs heavier than water. Pleura slightly affected.

"*Heart.*—Deposit of lymph in pericardium. Endocardium of right ventricle congested and livid, almost black.

"*Liver* and *Spleen* of normal size, but darker in colour than usual.

"*Kidneys.*—The left kidney very much congested, the right one healthy.

"*Intestines.*—There were patches of inflammation over all the bowels and mesentery.

"The *Blood* very dark and fluid."

The condition of the lungs here described is, as I shall hope to show, of considerable interest in relation to some experiments which I made with the disease upon animals. The lung affection is evidently a marked and constant feature of the disease, and the principal conditions are subpleural exudation and a sort of bronchial catarrh. These I have been able to reproduce by inoculation of the disease in guinea-pigs and mice, with characters apparently almost identical with those seen in the original disease. Moreover, these lesions were in both situations attended with the presence of bacilli in the affected parts in the initial stages of the morbid process, disappearing as it reached its maximum.

Of the original disease I have only had the opportunity of examining one specimen, a piece of the affected lung. This was not in a condition for examination for bacteria. The principal change was evidently an inflammation, slight in degree, which followed the lines of the bronchi, but in many places was evidently outside them. Some of the bronchi, especially those of medium size, showed signs of catarrh, but there were a large number of which the mucous membrane appeared absolutely healthy.

But in a large number of sections there were very marked changes around the vessels supplying the walls of the bronchi. Some of these were completely plugged by masses of leucocytes, and around them for some little distance were the ordinary appearances of inflammation. There were here and there patches of exudation, extending to close beneath the bronchial mucous membrane.

The epithelial lining was in many of these perfectly healthy in appearance, but here and there the sub-mucous tissue considerably swollen and infiltrated. But the absence of bronchial catarrh was in most parts very striking; only rarely was there any exudation in the air-cells. The pleura was thickened in scattered patches, apparently by exudation into its substance, which was partly inflammatory, partly hæmorrhagic but no superficial effusion was observed.

Let me anticipate what I shall have to say with regard to the results in rodents, for the sake of drawing a parallel between the condition here described and that found in them. In two mice, the one inoculated from the other, the first having been inoculated from a guinea-pig, I found these changes. In the first, marked pulmonary congestion with slight subpleural exudation. In this lung I found commencing inflammation of the subpleural tissue with slight hæmorrhagic exudation on the surface. Both in patches of the lung tissue, and in these deeper pleural layers and in the exudate I found here and there abundant bacilli, agreeing both with those cultivated from the peritoneal exudation and those seen in the other animals. These were only found locally at the spots of commencing inflammation, and not elsewhere, except scattered in the lung.

In the second animal there was no pleural exudation. I found, however, that in some of the larger bronchi, those near the root of the lung, there was incipient catarrh; that this was not general, but limited to some parts of the circumference of the tube examined, and that side by side with affected bronchi were others absolutely healthy.

Then I found that these affected parts corresponded with vessels which were the seat of commencing inflammation, and that around them in the tissues between them and the bronchi were long bacilli, corresponding exactly with those seen in the peritoneum, and in the lung and pleura of mouse No. 1. These bacilli one could trace passing through the walls of the vessels, and some were also seen in the blood within the vessels. As the inflammation began, they seemed to disappear, indicating the probability that inflammation is attended by their destruction.

Similar bacilli were also found in the blood-vessels of the kidney, but I have as yet failed to find them in other organs.

I may now describe these experiments. Some blood, which had been preserved in carefully filled capillary tubes, and some mucus from the nostrils were the materials used. The blood when examined was found to contain some spore-like bodies, a few remains of short rods, and also a few micrococci. A guinea-pig which was inoculated with the blood died in seventeen hours. When examined, four hours after death, there was very slight inflammation and serous exudation at the seat of inoculation, the heart was filled with coagula, the organs generally appeared natural. The blood contained numerous rods and also free spores; that taken from the heart containing the greatest abundance, more than the splenic blood.

Another guinea-pig, inoculated at the same time as the first, did not die till twelve hours later; it presented similar appearances, but there was more exudation at the points of inoculation.

Some blood-stained serum from the heart of guinea-pig No. 1 was kept in capillary tubes at normal temperatures for four weeks, and it was then used to inoculate two mice, with very minute quantities. One of these died in twelve hours, and was examined after nine hours. There was no local inflammation in the tail where it had been inoculated, and no inflammation of the peritoneum. The spleen was large and rather soft, the other viscera healthy, except slight injection of the pleura. Blood taken from the right ventricle was found to contain very numerous long rods, many of them measuring 80 μ in length, some containing spores.

Another mouse was inoculated in the tail with a minute quantity of serum collected in the peritoneum of the previous one, and, like it, died in twelve hours. When examined, three and a-half hours after death, some inflammation was found extending along the surface of the abdomen, and some slightly turbid exudation in the peritoneum; the latter containing a large number of long rods like those in the previous case.

On comparing together specimens of blood from these animals and some from cases of undoubted anthrax, a very close similarity is discovered. The chief differences are that the bacilli in most cases of true anthrax are much more abundant; and that the bacilli in Cape fever were more slender. But I find a considerable difference in this respect in bacilli in anthrax; in specimens from some animals they are decidedly smaller than in others. In other respects, their varying length, junction of two segments at an acute angle, or formation of long rods made up of nearly equal segments, they are very similar in appearance.

In the viscera I did not find any important changes beyond those already mentioned in speaking of the lungs.

It is indeed a most striking feature of all these forms of blood-poisoning that the changes in the organs are so slight in degree or may be quite undiscoverable.

There is one other point of distinction from anthrax which I must note, viz., that the growth of the bacilli in cultivating fluids is much less voluminous than that usual with anthrax bacillus, although in its main features it is very similar.

I was able to cultivate the organisms found in the blood, spleen, and peritoneal serum of the guinea-pig for several generations; and also those from the peritoneum and pleura of the mice subsequently inoculated. The various stages were as follows: they were repeated again and again in successive cultivations, so that the various stages could be watched side by side in crops of different ages.

The rods first formed were long and slender, measuring sometimes (as in the mouse examined three hours after death) as much as 15 μ to 90 μ in length, and about ·6 μ in thickness.

They were usually quite motionless, but some of them moved very slowly along with a slightly wavy motion.

These rods, when cultivated, grew rapidly to an enormous length, some extending almost the entire width of the field (about 200 μ). In these longer ones there were sometimes, at an early period, indications of subdivision into shorter rods, from 10 to 30 μ in length; but they often produced the twisted rope-like forms before any subdivision. Once or twice a moving stage was observed in rods about 15 to 25 μ in length; but this was uncommon.

In these elongated rods the formation of spores proceeds in the usual manner, though, on account of their smaller size, the steps could not be so readily watched as in the ordinary anthrax bacilli.

These spores were pretty regularly arranged in a definite order in the rods, sometimes in couples, *i.e.* the alternate spaces narrower.

In the rods which had undergone partial division before the formation of spores, these were frequently more closely set together; and the filaments broke down more rapidly into a mass of spores, some of which had escaped from the filament, others had been formed by its division.

Although these observations are not sufficiently extensive to warrant any definite and final conclusions, they seem to me to indicate that the disease, although allied to anthrax, may yet be distinguished from it by the predominant affection of the lungs, by the relatively small number of bacilli which are found in the blood and organs, as well as by the size of the bacilli themselves.

In true anthrax the growth of bacilli is enormous, their distribution general throughout the body, and in many of the organs the blood-vessels are often found to be plugged by masses of them.

In the Cape Horse-fever they are produced in relatively small numbers, and display a preference for certain sites, circulating in the blood and wandering out of the vessels at certain points, at which they appear to set up inflammatory changes, and lead to characteristic results which form the anatomy of the disease.

In anthrax the blood is the site of their growth, and the sole anatomical characteristic in most cases is the swelling of the spleen, which is due to the peculiar relations to the blood. At the same time it must be allowed that cases of anthrax do occur in which the morbid process does not specially affect the spleen, an example of this is seen in the sheep inoculated with anthrax.

I am not yet in a position to say whether these two diseases are identical, viz., anthrax and Cape fever, or whether the bacilli are the same in both; my own belief is that they are not identical, but are two members of one group.

With regard to Loodiana fever, which appears to be very closely allied to, if not identical with, the Cape horse-sickness. I can say but little. There appears to be usually more swelling of the throat, with infiltration of the intermuscular planes, than in the common form of Cape fever.

XVII.—*Annual Report of the Consulting Chemist for* 1879.

By Dr. Augustus Voelcker, F.R.S.

Since the opening of the Society's Laboratory, at 12 Hanover Square, last March, 843 samples were received for analysis up to the 1st of December, 1879; and between the 1st of December, 1878, and March 1879, 175 analyses were made by me for members of the Royal Agricultural Society in my laboratory at 11, Salisbury Square, making a total of 1018 analyses for that year between the 1st of December, 1878, and 1st of December, 1879. This number exceeds that of the analyses made for members of the Society in the preceding year by 294, and in that terminating 1st December, 1877, by 376. The tabulated summary appended to this Report shows that the largest number of analyses were made of samples of dissolved bones, superphosphate and compound artificial manures, the majority of which were found of good quality. Next to artificial manures in the list stand linseed- and other feeding-cakes, 257 cakes having passed through my hands, besides 36 samples of feeding-meals.

Nearly twice as many samples of bone-dust as in the preceding year were sent for analysis. Some of these were adulterated samples, and others samples sold under a wrong denomination.

Leaving unnoticed cases of gross adulteration, the particulars of which will be found in the Quarterly Reports of the Chemical Committee, I beg leave to offer a few remarks on the analytical work in the Society's laboratory during the last twelve months.

COMPOSITION OF GUANO.

None of the 84 samples of guano analysed by me during the past season were purposely adulterated, and the majority were found to be well worth the price at which the guano was sold. In not a few instances, however, the quality of the guano did not correspond with its market-price, and in some cases the composition of the bulk-sample delivered to the purchaser did not agree with that represented by the analysis of the official sample of the cargo from which the guano was alleged to have been supplied to the purchaser. It is to be feared that unscrupulous retail manure-dealers buy in the wholesale market inferior guano at the fair official rates at which such guanos are sold by the Peruvian Government agents, and retail it to farmers at prices at which the best Peruvian guano can be bought.

It is an unfortunate circumstance that the characters and composition of the different guano-deposits in South Peru vary greatly with the particular locality from which they are shipped to England; and as the present importations into England of Peruvian guano come from the south of Peru, their agricultural and commercial value necessarily varies considerably. Thus, cargoes from the deposits at Pabillon de Pica are richer in ammonia and more valuable than those from the Huanillos deposits, and these again have a much higher value than the guano from the deposits at Lobos de Afuera and Lobos de Tierra. A dealer in manures, as a rule, takes good care to protect his interests, and he is in a position to ascertain, with comparative little trouble or expense, whether or not a guano which he intends to buy is really part of the particular cargo from which the official sample was drawn, and according to which its price has been fixed by the Peruvian Government agents; but in most cases the purchaser of a ton or two of guano has no means of ascertaining whether the guano delivered by a local manure-dealer is part of the cargo which it is represented to be in the official analysis. The general guarantee that guano is genuine Peruvian, as pointed out in a former Report, at the present time has lost its significance and is liable to mislead farmers.

It is much to be regretted that all Peruvian guano is not sold of a fairly uniform quality at one uniform price, for, as stated already, the buyer of guano, especially if he be a small farmer requiring but a single ton or less, is exposed to the risk of being supplied by local dealers with an inferior guano, for which he will have to pay the top price of the best cargoes.

In illustration of these remarks the following three analyses made during the past season for members of the Society may be quoted:—

No. 1, it will be seen, contains fully 2 per cent. more ammonia, more soluble phosphoric acid, and less moisture than the guano marked No. 2, and is worth about 2*l.* more per ton than the latter. Nevertheless, No. 1 was bought at Liverpool at 12*l.* 5*s.* a ton, whereas 13*l.* 10*s.* per ton was asked for No. 2, that is 1*l.* 5*s.* more than for the superior guano. Again, it will be seen that No. 3 contained a little more ammonia, 6½ per cent. more phosphates, and much less water than No. 2, and yet it was sold at 10*s.* less per ton than No. 2.

COMPOSITION OF THREE SAMPLES OF PERUVIAN GUANO.

	No. 1.	No. 2.	No. 3.
Moisture	13·18	19·75	9·87
*Organic matter and ammoniacal salts ..	36·19	29·38	30·17
Phosphate of lime	15·19	19·85	23·19
†Alkaline salts, &c.	17·58	26·33	22·95
Insoluble siliceous matter	17·86	4·69	13·82
	100·00	100·00	100·00
*Containing nitrogen	8·05	6·16	6·44
Equal to ammonia	9·77	7·48	7·82
†Containing phosphoric acid	3·96	2·43	3·89
Equal to tribasic phosphate of lime..	8·65	5·31	8·48
Total percentage of phosphoric acid	10·92	11·52	14·51
Equal to tribasic phosphate of lime..	23·84	25·16	31·67

I need hardly say that 13*l.* 10*s.* is an extravagant price for Peruvian guano which contained only 7½ per cent. of ammonia, and that 13*l.* is also too much for a guano of the composition of the sample No. 3.

A guano of the composition of sample No. 1, and costing in Liverpool 12*l.* 5*s.* per ton, probably would have to be sold retail in the country at 13*l.* to 13*l.* 10*s.*, including carriage; but as the inferior guano No. 2 was sold at 13*l.* 10*s.* at Shifnal at the same time when Peruvian guano worth 2*l.* more per ton was sold at Liverpool at 12*l.* 5*s.* per ton, it appears to be probable that either the dealer took an unfair advantage of the fact that 13*l.* to 13*l.* 10*s.* was the retail price of high class Peruvian guano at the time, or that the inferior guano was sold on the basis of an analysis representing the composition of a high-class Peruvian guano.

There is another point in connection with the sale of Peruvian guano to which I desire to call attention. The importations from the guano deposits in South Peru frequently contain more or less considerable quantities of stones, for which the Government agents allow a full deduction to the wholesale dealers; it is therefore only fair that they should make the same allowance for stones in retailing the guano. Unless the farmer makes this just demand of the dealer for a reduction in the price of guano corresponding to the weight of stones in it, I fear he will not unfrequently pay for stones the same price which he gives for guano. The weight of stones in guano may be considerable, as will appear from a letter which I received a short time ago from a gentleman, informing me that the weight of stones in 4 tons of guano bought by him amounted to 6 cwts. and 2 lbs.

ARTIFICIAL MANURES AND SUPERPHOSPHATES.

As usual, a number of inferior artificial manures were received for analysis during the past season, some of which were not only sold under wrong or misleading names, but also at far too high a price. Thus, a sample of manure which was sold under the name of turnip-manure at 7*l.* 7*s.* a ton, on analysis was found to have the following composition:—

Moisture		21·30
Water of combination		10·73
Monobasic phosphate of lime		12·78
(Equal to tribasic phosphate of lime rendered soluble by acid)	(20·02)	
Insoluble phosphates		9·58
Sulphate of lime, &c.		39·65
Insoluble siliceous matter		5·96
		100·00

In point of fact this turnip-manure was nothing more or less than a badly made mineral superphosphate, of a quality which can be readily bought in most places at 4*l.* a ton, or at considerably less money in localities favourably situated as regards the supply of superphosphate. The demand of 7*l.* 7*s.* for a mineral superphosphate which would be dear at 4*l.* a ton, is quite inconsistent with fair dealings.

In proof of the assertion that this turnip-manure, or rather mineral superphosphate, would have been dear at 4*l.*, I quote the results of the analysis of three samples of artificial manures for roots which a member sent me last June. The three manures had the following composition:—

	No. 1.	No. 2.	No. 3.
Moisture	22.85	18·58	14·70
Organic matter and water of combustion	8·41	11·05	9·30
Monobasic phosphate of lime	20·68	18·07	6·41
(Equal to tribasic phosphates rendered soluble)	(32·37)	(28·29)	(10·04)
Insoluble phosphates	6·94	5·18	8·97
Sulphate of lime, &c.	39·54	40·84	55·34
Insoluble siliceous matter	1·58	6·28	5·28
	100·00	100·00	100·00

	£	*s.*	*d.*	
The cost of No. 1 was	5	4	6	per ton
" No. 2 "	4	12	6	" and
" No. 3 "	4	15	0	"

Both No. 1 and No. 2, it will be seen, are good mineral superphosphates. In No. 1, 32 per cent. of soluble phosphate cost 5*l.* 4*s.* 6*d.*, or 104*s.* 6*d.*, which makes the price for the unit per cent. of soluble phosphate 3*s.* 3*d.*

In the superphosphate No. 2, 28 per cent. of soluble cost 4*l.* 12*s.* 6*d.*, or 92*s.* 6*d.*, or the unit per cent. 3*s.* 3¾*d.*

The more expensive of the two superphosphates thus was really the cheaper of the two, for, making no allowance for any of the other constituents of the two samples, the unit per cent. of soluble phosphate in No. 1 was obtained at ¾*d.* less than it cost in No. 2. Both manures were cheap at the price at which they were sold. On the same basis of valuation the turnip-manure, which was sold at 7*l.* 7*s.*, would be worth only 3*l.* 5*s.*, or less than one-half the price at which it was actually sold. The sample marked No. 3, costing 4*l.* 15*s.* a ton, was sold as a bone-phosphate, but it contained no bone, and was a poor superphosphate made from bone-ash, with the addition of much gypsum, and, I need hardly say, was not worth 4*l.* 15*s.* a ton. Indeed 1 ton of the sample No. 2, costing 4*l.* 12*s.* 6*d.*, is worth rather more than 2 tons of the so-called bone-phosphate No. 3, costing 9*l.* 10*s.*

The name dissolved bones, I regret to say, still continues to be applied to mixtures of mineral superphosphates and small proportions of bone.

Thus a sample of so-called dissolved bone, the selling price of which was 6*l.* 10*s.* a ton, had the following composition :—

Moisture	11·85
*Organic matter and water of combination	20·61
Monobasic phosphate of lime	6·59
(Equal to tribasic phosphate of lime rendered soluble by acid)	(10·11)
Insoluble phosphates	5·94
Sulphate of lime, &c.	47·62
Insoluble siliceous matter	7·39
	100·00
* Containing nitrogen	·65
Equal to ammonia	·79

The manure contained only 8 per cent. of bone, and thus should not have been sold under the name of dissolved bone; nor should 6*l.* 10*s.* have been asked for it, for it would not have been cheap at 3*l.* 10*s.* a ton.

I will only give one more instance of a manure which was found on analysis to be worth scarcely one-half the price at which it was sold. The following is the composition of a mangold-manure, cost 7*l.* per ton:—

Moisture	17·45
*Organic matter and water of combination	26·39
Monobasic phosphate of lime	4·93
(Equal to tribasic phosphate rendered soluble by acid)	(7·73)
Insoluble phosphates	6·64
Sulphate of lime, &c.	27·90
Insoluble siliceous matter	16·69
	100·00
* Containing nitrogen	·55
Equal to ammonia	·67

The price charged for this manure, 7*l.* a ton, is quite out of proportion to its real value, which scarcely amounted to 3*l.* 10*s.* a ton. The gentleman for whom I made this analysis wrote to me as follows: "I am very pleased I sent you the mangold-manure for analysis; it tells me of the great importance attached to the same, and ten times repays for the fee charged."

COMPOSITION OF SOOT.

Soot, as is well known, is a manure which is principally used as a top-dressing for cereal crops. Its fertilising properties depend entirely upon the sulphate of ammonia which different samples contain in very variable proportions, as will be seen by the subjoined analyses:—

	No. 1.	No. 2.
Moisture	3·68	6·11
*Organic (carbonaceous) matter and salts of ammonia	40·17	70·45
Oxides of iron and alumina	4·39	4·05
Carbonate of lime	10·91	6·99
Insoluble siliceous matter	40·85	12·40
	100·00	100·00
* Containing nitrogen	2·35	3·63
Equal to ammonia	2·85	4·40
Equal to sulphate of ammonia	11·08	17·11

In a third sample of soot I found:—

Nitrogen	5·04
Equal to ammonia	6·12
Equal to sulphate of ammonia	23·76

The sender of sample No. 1 informed me that he paid 55*s.* for it, but that the sweep grumbled hard at so low a price, as he called it. This soot, however, was poor in ammonia, and apparently mixed with a good deal of fine coal-ashes, and instead of being cheap, was scarcely worth 2*l.* a ton as a manure. The second sample was genuine soot, of fair average quality, and worth one-half more per ton than the sample No. 1, and not dear at 3*l.* per ton; whilst the third sample contained an unusually high percentage of sulphate of ammonia, and was very cheap at 3*l.* a ton.

BATS' GUANO.

The following is the composition of an unusually rich sample of bats' dung :—

Moisture	11·42
*Organic matter and salts of ammonia	73·58
Phosphate of lime	8·47
†Alkaline salts	5·88
Insoluble siliceous matter	·65
	100·00

* Containing nitrogen	8·92
Equal to ammonia	10·83
† Containing soluble phosphoric acid	1·14
Equal to phosphate of lime	2·49
Total phosphoric acid	5·02
Equal to tribasic phosphate of lime	10·96

This bats' guano contained fully as much nitrogen as the best samples of Peruvian guano; and as it was sold in Liverpool at 8*l.*, it was evidently a very cheap and valuable fertiliser.

RICE-MEAL.

In dressing rice for the market, a cheap and useful feeding-stuff is produced, which is sold under the name of rice-meal.

It consists of ground broken rice, and the external layers of the grain of rice, and has a white, or generally pale-yellowish colour. Commercial samples vary to some extent in colour, some being whiter than others, and still more so in composition, as will be seen by the following analyses of samples recently sent to me by members of the Royal Agricultural Society :—

Good rice-meal is sold at present at from 4*l.* 10*s.* to 5*l.* a ton, and at that price I consider good samples cheap.

Rice-meal, it will be seen, contains as much ready-formed fat as first-class linseed-cake, and rather less indigestible fibre. On the other hand, linseed-cake contains fully twice as much of albuminoids as rice-meal.

COMPOSITION OF FIVE SAMPLES OF RICE-MEAL.

	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.
Moisture	14·35	12·90	10·55	9·65	9·85
Oil	10·73	10·60	10·56	11·66	14·51
*Albuminous compounds (flesh-forming matters)	11·12	10.87	13·18	14·06	13·12
Starch and digestible fibre ..	48·62	50·48	53·05	50·57	45·60
Woody fibre (cellulose)	6·83	7·40	5·56	5.86	8.31
†Mineral matter (ash)	8·35	7·75	7·10	8·20	8·61
	100·00	100.00	100·00	100·00	100·00
* Containing nitrogen ..	1·78	1·74	2·11	2·25	2·10
† Including silica	2·60	2·10	1·05	2·05	1·80

Judging from its composition, rice-meal is better adapted for fattening cattle than young stock, and is a most useful food for milking-cows, in conjunction with bean-meal or decorticated-cotton, or rape-cake, or other food rich in nitrogenous matters.

The sample No. 5, it will be seen, contained 14½ per cent. of oil, which is more than occurs in most samples of first-class pure linseed-cake. Fearing an error might have crept into the oil determination, I repeated the analysis, and obtained closely agreeing results in both analyses.

Occasionally rice-meal of a very inferior character is sold in the market. On analysis of such a meal I obtained the following results: —

Composition of very inferior Rice-meal.

Moisture	8·95
Oil	4·06
*Albuminous compounds (flesh-forming matters) ..	4·44
Starch and digestible fibre	40·82
Indigestible woody fibre (cellulose)	27·93
†Mineral matters (ash)	13·80
	100·00
* Containing nitrogen	·71
† Including silica	11·70

The meal, it appears, consisted principally of the harsh, innutritious, outer husks of rice, or rice-shells, which have hardly any nutritive value, for they consist mainly of indigestible woody fibre, coated with fine silica. This explains the large amount of silica in the ash of the rice-meal, and its poverty in flesh-forming matters and digestible non-nitrogenous compounds. The meal was sent to me for analysis because it produced a bad effect upon young stock, and was supposed to contain some poisonous constituents. However, I found it free from any decidedly prejudicial ingredient, but of course had to pronounce it to be quite unfit for supporting the health and good condition of young stock.

Whilst speaking of feeding-meals, I would call attention to linseed-meal. When buying linseed-meal it should be remembered that linseed-cake reduced to powder, and not linseed crushed to meal, as might be expected, constitutes linseed-meal. A sample of linseed-meal recently examined by me was sold at Liverpool at 10*l.* 5*s.* per ton, at a time when pure linseed-cake could be bought in the same city at 9*l.* 9*s.* a ton.

Another sample, sold as crushed linseed at 8*l.* 10*s.* per ton, had the following composition:—

Moisture	12·60
Oil	3·50
*Albuminous compounds (flesh-forming matters)	31·93
Mucilage and digestible fibre	36·72
Indigestible woody fibre (cellulose)	9·80
Mineral matter (ash)	5·45
	100·00
* Containing nitrogen	5·11

Crushed linseed contains from 30 to 38 per cent. of oil, and good linseed-cake from 10 to 12 per cent., whereas the sample of crushed linseed analysed by me contained only 3½ per cent. It is evident, therefore, that the meal in question was not crushed linseed, nor even ordinary linseed-cake reduced to powder; for it is impossible to deprive linseed by pressure so thoroughly of its oil as to leave only 3½ per cent. in the press-cake, and it appears that the meal was not crushed linseed, nor ordinary linseed-cake reduced to meal, but crushed linseed, from which nearly the whole of the oil had been extracted by chemical means, probably by bisulphide of carbon.

It has been frequently noticed by farmers that horses and cattle prefer foul stagnant pond-water, visibly impregnated with the drainage from dunghills or farmyards, to clear pure water, and the prevalent notion of farmers is that such foul water will do no harm to stock. Leaving it undecided whether cattle and horses are really fond of water spiced with liquid manure, or whether they prefer it to pure clear spring or pump-water, because for the greater part of the year pond-water is warmer than cold spring or pump-water, I must think that yellow-coloured fœtid pond-water, more or less impregnated with liquid manure or yard-drainage, cannot be conducive to the health of farm-stock. In confirmation of this view, I may relate a case in point which has lately been brought under my notice. A member of the Society sent me a sample of water for analysis, requesting an opinion whether it was fit for carthorses to drink. My correspondent informed me that the water came from a pit which received the drains of all his yards, and that in the course of two years during which he had occupied the farm he had lost two valuable carthorses from colic, whilst others suffered from the same affection, but recovered under medical treatment. The veterinary surgeon who was called in stated that the water had been noted for years for griping horses.

The water had a deep-yellow colour and a bad smell. On evaporation to dryness, it left per imperial gallon—

	grains.
Organic matter	52·6
Chloride of sodium (common salt)	50·7
Nitric acid as nitrates	3·8

It further contained per gallon:—

	grains.
Actual (saline) ammonia	1·255
Organic (albuminoid) ammonia	·680

In my judgment, water so largely impregnated with organic matter and drainage products is decidedly injurious to horses, and ought not to be used for drinking purposes.

The 'Journal' of the Society for 1879 contains the following contributions of mine:—

1. Report on the Field and Feeding Experiments at Woburn.
2. Annual Report for 1878.

I have completed a laboratory investigation relating to dairy matters, the results of which I hope to embody in several Papers in a future number of the Society's 'Journal,' for which I have prepared a detailed report of the Woburn Experiments in 1879.

In the course of the year I paid fourteen visits to the experimental field and Crawley mill-farm.

Analyses made for Members of the Royal Agricultural Society from 1st December, 1878 to 1st December, 1879.

Guanos	84
Dissolved bones, superphosphates, and compound artificial manures	322
Bone-dust	81
Nitrate of soda	65
Sulphate of ammonia	11
Kainite and potash-salts	13
Soot	3
Sulphate of magnesia	2
Refuse manures	28
Feeding-cakes	257
Feeding-meals	36
Vegetable productions	5
Milks and butter	10
Waters	52
Soils	25
Limestones and other minerals	13
Soaps, oil, and beer	5
Examinations for poison	6
Total	1018

XVIII.—*Annual Report of the Consulting Botanist for* 1879.

By W. CARRUTHERS, F.R.S.

DURING the past year my attention has been specially, by various members of the Society, drawn to the vitality of seeds for permanent pasture. A large number of samples have been carefully analysed and examined with this general result—that the samples of grasses in the market are generally free from injurious weeds, but that some species appear to be regularly harvested before the grain is perfected, the almost empty glumes in these cases being, of course, of no value for sowing.

Several cases of injuries due to the prevalence of ergot have been brought under my notice. This parasitic fungus has been specially abundant during the past year in pasture-lands, owing, no doubt, to the favouring conditions of the weather. This parasite has been very injurious to the stock on the property in Australia of a member of the Society. I have investigated the conditions under which it appeared there, and have supplied information as to dealing with the pest that I anticipate will lead at least to an alleviation of the injury.

With the help of my colleague who assists me in inquiries relating to animal injuries, I have prepared reports for the Government on the best means of coping with the locusts, which have proved very destructive to vegetation in Cyprus, from the practical carrying out of which I expect satisfactory results.

Insect plagues affecting the hops, and locusts and grasshoppers, which have been injurious to vegetation in Australia, have engaged our attention, and reports on these insects have been supplied to members.

The number of applications for information has greatly increased during the past year.

The Seeds and Plant Diseases Committee have considered the question of encouraging the production of improved varieties of wheat, and the Council having accepted the proposals, and offered prizes for seed-wheat, the samples sent in for competition have been distributed for experimental cultivation.

XIX.—*Quarterly Reports of the Chemical Committee.*

July, 1879.

1. A sample of manure was sent from the neighbourhood of Croydon, which on analysis furnished the following results:—

Moisture	20·60
*Organic matter	14·19
Phosphate of lime	2·05
Oxide of iron and alumina	9·36
Carbonate of lime	26·68
Alkaline salts	2·61
(including 1·08 of nitrate of soda)	
Insoluble siliceous matter (sand)	24·51
	100·00
* Containing nitrogen	·35
Equal to ammonia	·48

It will be seen that this manure contained only 2 per cent. of phosphate of lime, 1 per cent. of nitrate of soda, and scarcely ½ per cent. of ammonia; the rest of the constituents have no intrinsic fertilising value, and the manure was scarcely concentrated enough to repay the cost of carriage to any considerable distance. In reply to the usual inquiries the purchaser wrote as follows:—

"Croydon, April 2nd, 1879.

"Dear Sir,—I am in receipt of your favour together with your analysis of the sample of manure I sent to you, which appears from that to be almost worthless.

"It is called Blood Manure, and is made by a person who is somewhat an amateur at it, and from his representations as to results in former years, I was induced to try it, but not liking the appearance of it, I thought I would get an analysis of it from you. The price of it is 7*l*. per ton. Before disclosing who it is, I wish to let him see what you have sent me, as I do not wish to expose him if he settles fairly, otherwise I shall ask you to give as much publicity to it as possible.

"Yours faithfully, with thanks,

"* * * *

"A. Voelcker, Esq."

2. A sample of nitrate of soda sent from Shropshire had the following composition:—

Moisture	3·49
Chloride of sodium (common salt)	23·25
Other impurities	1·01
Pure nitrate of soda	72·25
	100·00

Supposing good commercial nitrate of soda guaranteed to contain 95 per cent. of pure nitrate to cost 14*l*. a ton, this sample—which contained 23¼ per cent. of common salt—would be worth only 10*l*. 13*s*. per ton.

Instead of the required information, the purchaser sent the following note:—

"May 14th, 1879.

"Sir,—The agent I had the nitrate from came here, and we took a sample which we sealed up, and he took it to the analyst for the Shropshire Chamber of Agriculture, and sent me his analysis, which I enclose. He has sown four tons of it on his farm. The only difference that I know of in the samples was that what I sent you was all fine; and the other was more in lumps. Would that account for the difference in the quantity of salt?

"I am, Sir, yours truly,

"* * * *"

The following is a copy of the analysis referred to:—

Moisture	2·40
Chloride of sodium	1·58
Nitrate of soda	96·02
	100·00

An excellent sample.

Attention is directed to the fact that the vendor took a more lumpy sample for analysis than the one which the purchaser sent to the Society's Laboratory. If common salt had been mixed with the nitrate of soda, the salt would not amalgamate with the lumps of genuine and good commercial nitrate of soda, but become mixed with the finer portions, and hence a good sample might be drawn whilst another sample taken from the finer portion of the contents of the same bag might prove to be adulterated with common salt.

In reply to repeated applications for fuller information and invoice, the purchaser declined to accede to the request in the following letter:—

> "SIR,—I should have returned the form at once if I had intended to fill it up; but I object to having my name published in the 'Journal,' as I have seen other farmers' in connection with samples sent to be analysed. According to your way of taking a sample, the one I sent is not a fair one, as it was taken from the top of two bags, and mixed together; but nitrate of soda, I should think, ought to be genuine whether taken from the top or middle of a bag.
>
> "Of course I go by your analysis, and it depends on how I am met by the agent as to whether I deal with him again in any way.
>
> "I am, Sir, yours truly,
>
> "Dr. Voelcker." "* * * *

4. A sample of nitrate of soda sent by Mr. J. L. Baker, Hargrave, near Kimbolton, bought at Liverpool, at 13*l.* a ton, on analysis had the following composition:—

Moisture	4·40
Chloride of sodium	35·00
Other impurities	·55
Pure nitrate of soda	60·05
	100·00

In comparison with good nitrate of soda, guaranteed to contain 95 per cent. of pure nitrate of soda, and selling at 13*l.* a ton, the sample sent by Mr. Baker containing only 60 per cent. of pure nitrate and as much as 35 per cent. of common salt, was worth 8*l.* 4*s.* 2*d.* per ton.

Four tons of the nitrate of soda were bought by Mr. J. L. Baker from a neighbouring farmer and manure agent, whose name he declined to give, and who stated that he purchased the nitrate in question of another dealer, and that he sold it to Mr. Baker at about 5*s.* per ton profit. The vendors, on being communicated with, replied as follows:—

> "Anerley, May 30th, 1879.
>
> "DEAR SIR,—We have not sold Baker any nitrate of soda, nor warranted any 95 per cent. What we supply may or may not contain 95 or more than that. We never sell by analysis, because what security is there that the analysis would represent what we sent?
>
> "When goods are sent by analysis a sample is taken *at the time of sale in presence of both* buyer and seller or their agents, and there and then sealed up and sent to a chemist which both parties approve, otherwise persons would often attempt to defraud, as they have done before.
>
> "Dr. Voelcker's remarks are stupid. He says, suppose the nitrate of soda to be worth 13*l.*, the price was and is 14*l.* 10*s.*, and then the valuation, 8*l.* 4*s.* 2*d.*, is absurd, there could be none so low. We have nothing to do with the case; but if we were you, we should tell Baker that you did not guarantee 95, and if you did, the analysis was not done at the time of sale, and under the circumstances before mentioned.
>
> "Yours truly,
>
> (Signed) "HALE AND CO."

Ultimately Mr. Baker agreed to a compromise with the agent from whom he bought it, to pay for the nitrate on the basis of Dr. Voelcker's valuation.

5. Two samples of Black Sea rape cake, warranted to be pure rape, on analysis were found to consist not only of crushed rape seed, but mainly of the dirt and small weed seeds which are sifted out of oily seeds in cleaning them for the market. The cakes sent for analysis contained nearly 10 per cent. of sand, and less nitrogen than good and genuine manure rape cake.

Attention is directed to these cases chiefly because the application to the land of such rape cakes may do much mischief in sowing a plentiful crop of weeds unless especial care be taken to destroy the germinating power of the numerous small weed seeds of which the bulk of these cakes consists.

6. The following case has no reference to adulteration, but is given as a striking illustration of the advantage which a farmer may derive from buying manures of well-known character and definite composition, and mixing them together in certain proportions, in preference to buying similar mixtures in the form of compound artificial manures.

A member of the Society sent two samples of artificial manures which had the following composition:—

	No. 1.	No. 2.
Moisture	8·71	11·51
*Organic matter and salts of ammonia ..	24·49	29·73
Monobasic phosphate of lime	8·08	11·09
Equal to tribasic (bone phosphate) phosphate of lime	(12·66)	(17·52)
Insoluble phosphates	16·15	17·63
†Sulphate of lime and alkaline salts	40·66	25·25
Insoluble siliceous matter	1·91	4·79
	100·00	100·00
*Containing nitrogen	4·91	4·02
Equal to ammonia	5·96	4·88
†Including nitrate of soda ..	14·61	1.20

The sample marked No. 1 was made on the farm by mixing together sulphate of ammonia, concentrated superphosphate, bone-meal, and nitrate of soda, in the following proportions and costs:—

	£	*s.*	*d.*
One ton sulphate of ammonia, at per ton	17	10	0
One ton nitrate of soda, at per ton	13	11	3
Two tons of superphosphate, containing 35 per cent. of soluble phosphate, at 4*l.* 15*s.*	9	10	0
Two tons of fine bone-meal (boiled), expected to contain 2½ per cent. of ammonia, and 50·55 per cent. of phosphate of lime, at 7*l.* 5*s.* 10*d.* per ton	14	11	8
	£55	2	11

or 9*l.* 3*s.* 10*d.* per ton, carriage paid to stations 3 and 3½ miles distant from the farm.

The compound manure marked No. 2 was sold at 13*l.* per ton cash, or 14*l.* per ton payable in November.

It will be seen that the manure marked No. 1 contained, in round numbers, 5 per cent. less soluble phosphate of lime, and 1½ per cent. less insoluble phosphate of lime than the purchased compound manure No. 2, sold at 13*l.* a ton. On the other hand, the latter contained 1 per cent. less ammonia, and 13 per cent. less nitrate of soda, than the manure which was produced on the farm at a cost of 9*l.* 3*s.* 10*d.* The value of the excess of the phosphates in No. 2 amounts to about 18*s.*, and the value of the excess of ammonia and nitrate of soda in No. 2 compared with No. 1 amounts to about 37*s.* per ton; consequently the mixture of sulphate of ammonia, superphosphate, bone-meal, and nitrate of soda, although costing only 9*l.* 3*s.* 10*d.*, was really worth 19*s.* more per ton than the more expensive purchased compound manure. Instead of buying a ready-made mixed manure, the saving of 4*l.* 15*s.* per ton was effected by mixing the named ingredients together, which leaves a very wide margin for the expense and trouble of compounding the manure on the farm.

The following extracts from a letter received by Dr. Voelcker from the member who sent the samples will be read with interest:—

"DEAR SIR,—I am favoured with your note enclosing the results of the analysis of the two samples of manures sent you. I am more than satisfied with the result of No. 1, my own mixture, although I never had any doubt of its being up to the mark, and well worth the money.

"I note what you say, 'that it is rather a joke to ask 13*l.* per ton for a manure like No. 2;' the seller of the manure represents it to be better and cheaper than any other manure in the market, and charges 13*l.* per ton cash, or 14*l.* per ton payable in November. He holds a land agent's situation, and makes use of his position in selling to his employer, and also to his employer's poor tenants, what you are now well aware from the analysis is a fair good manure at an exorbitant price. It is really too bad that those who ought to be the first to assist and enlighten poor struggling tenants in these depressed times should be the first to make use of their position to impose upon them—little wonder some farmers go to the wall with such treatment. I know many large and intelligent farmers who have no difficulty in purchasing cheap in quantities and mixing for themselves, but small tenants are not generally so well informed, nor are they in a position to purchase to advantage.

"I have no wish to interfere with respectable manure merchants, and such, I am pleased to say I have had no difficulty in finding them. If manure dealers as a class were led to know that those dealing with them had knowledge enough not to be imposed upon, such impositions as charging from 2*l.* to 5*l.* per ton over the true value of manure would soon be put an end to, and those of respectability would then, as now, be pleased to deal for cash even at small profits. I am always pleased to read your reports, and more pleased to have your letters.

"I am, dear Sir, yours faithfully,

"* * * *"

The Committee cannot help calling attention, as they have done before, to the numerous cases, of which several in the above report are examples, of the want of ordinary firmness and moral courage shown by those who, after putting the Society's consulting chemist and others to great trouble in correspondence, and in the investigation of the cases they bring forward, decline at the last to furnish the means of making them public, and of thereby enabling the Society to expose, as they desire, the nefarious dealings of which too many instances still come before them.

DECEMBER, 1879.

1. A sample of nitrate of soda was sent on June 9th, 1879, by Mr. R. B. Stafford, of Bedford, which he had purchased of Mr. J. Brightman, Lower Staughton, St. Neots, who informed Mr. Stafford that he obtained the nitrate from Messrs. Hale and Co., of Colchester House, Anerley.

On analysis this material yielded the following results:—

Moisture	3·65
Chloride of sodium (common salt)	56·50
Other impurities	1·50
Pure nitrate of soda	38·35
	100·00

The nitrate was bought at 13*l.* 12*s.* 6*d.* per ton, and, according to the purchaser's statement, was verbally guaranteed to contain 92 per cent. of pure nitrate. It will be seen that the sample sent by Mr. Stafford was adulterated with more than half its weight of common salt, and, according to the price to be paid on the face of the guarantee, it was worth only 5*l.* 8*s.* 6*d.* per ton.

Reports of previous cases of samples of nitrate of soda stated to have been supplied by Messrs. Hale and Co. have already appeared in the Quarterly Reports of the Committee. In these it will be seen that Messrs. Hale and Co. repudiate all responsibility for anything done or said by or to their agents, never sell by analysis, and treat Dr. Voelcker's remarks with derision.

2. Another sample of nitrate of soda was sent on July 8th by Mr. George Church, of Bedford, who purchased it from the same vendor, namely, Mr. J. Brightman, of Lower Staughton, St. Neots, the price paid being 14*l.* per ton, with a verbal guarantee of 95 per cent. of pure nitrate. This sample, on analysis, gave the following results:—

Moisture	3·30
Chloride of sodium (common salt)	41·50
Other impurities	1·25
Pure nitrate of soda	53·95
	100·00

In reply to the usual inquiries and request for the invoice, Mr. Church stated that "there being a contra-account between seller and self, I credited my account with the delivery and paid the difference."

According to this analysis, and the price to be paid for good commercial nitrate, the sample sent by Mr. Church is not worth more than 8*l.* per ton.

3. On the 20th of August, 1879, a sample of nitrate of soda was sent by Mr. F. Monckton, The Cage Farm, Tonbridge, who stated that he had received it direct from London. This sample yielded, on repeated analyses, the following results:—

Moisture	5·01
Chloride of sodium	26·87
Other impurities	·35
Pure nitrate of soda	67·77
	100·00

According to the statement of the purchaser this nitrate was bought with a guarantee of 95 per cent. pure nitrate, at 15*l.* 15*s.* per ton, delivered at Tonbridge, through a most respectable firm in this neighbourhood, but received direct from London, by South-Eastern Railway, from the importers.

Mr. Monckton subsequently wrote:—

"I have had transactions for years with the firm for cake, &c., and *particularly* wish their name kept from publication. It was at their suggestion I sent the soda to Dr. Voelcker: it was guaranteed 95 pure to them. I may add, I think it was a positive injury, as I applied the lot in question to stimulate hops, but having so much salt in it, and the weather following the application being wet and cold, the hops I believe would have been much better without it."

The purchaser, having complained to his vendors, received the following letter from the importers:—

"DEAR SIR,—We understand from Messrs. —— that you were the receiver of one ton nitrate of soda forwarded by us to Tonbridge Station on their account on the 16th August last; also that you have had this nitrate analysed by Dr. Voelcker, whose analysis shows a refraction of nearly 25 per cent. The writer of this was from home when the complaint reached us, but upon his return we wrote Messrs. —— fully upon the subject, and at their request we can only repeat to you the substance of our communication to them. We never in our experience knew of nitrate of soda *as imported* showing a refraction of anything like 25 per cent. This, coupled with the fact that the test of Messrs. Huson Bros., analysts for the cargo, only shows a refraction of 5·50, induces us to believe, either that some mistake has taken place in your sampling or in Dr. Voelcker's analysis.

"The nitrate which you received was delivered by the St. Catherine's Dock Company *from ship's side* to a public carman's vans, by which it was conveyed to the railway station. All this we can incontestably prove, and we are perfectly satisfied that nothing but nitrate *as imported* was sent to you.

"As mentioned to Mr. ——, we are willing to go personally and see the article complained of, and sample it in conjunction with you, and if it is still in your possession, we leave you to fix a day for this purpose.

"We addressed a letter to Dr. Voelcker yesterday in regard to his analysis, informing him of the result of Huson Bros.' test, and asking him to look over his analysis.

"We enclose his reply, from which you will observe that he makes it a rule to correspond only with the *sender* of the sample. Kindly return his letter to us.

"* * * *"

In answer to further inquiries, Dr. Voelcker received the following letter from Mr. Monckton:—

"The Cage, Tonbridge, Sept. 20, 1879.

"DEAR SIR,—I should have written before, but was anxious to afford you as much information as I could. The sample I sent you was taken from two bags only, as the rest were in the field, and nearly all used. I have portions of two bags that were left after the men had finished sowing, and from which Mr. —— of the importer's firm, who came to my farm on Tuesday last, carried away samples to be analysed. I enclose the analysis, which I received this morning, and at the same time an account from the firm I ordered the soda from, deducting 19*s.* 9*d.* from the amount first charged, 16*l.* 11*s.* 9*d.* for 1 ton 1 cwt. 7 lbs.

"Yours obediently,

"Dr. A. Voelcker." "FREDERICK MONCKTON."

"*Certificate of Refraction.*

"London Commercial Sale Rooms, Mincing Lane, E.C., and No. 1, Highbury Park, North, N.

"*(Original).* "London, September 17th, 1879.

"We hereby certify that we have examined the Refraction of the undermentioned Nitrate of Soda, and that the following is the result, viz.:—

"Per 'Tonbridge.' 12 lbs. per cwt. Refraction.

"E. F. TESCHEMACHER AND J. DENHAM SMITH.

Insoluble and moisture	4·25
Sulphates	·10
Muriates	7·65
	12·00

"Sample received, 16–9·79."

This case is not without difficulty, and shows that some tampering with the cargo must have taken place; but the Committee are unable to trace where this was done, and they publish the case to show that it is safer to buy by guarantee, and have all samples analysed.

4. Mr. J. C. Wallis, Home Farm, Didlington, Brandon, Norfolk, steward to W. A. T. Amhurst, Esq., wrote on June the 25th as follows:—

"HON. SIR,—I have a lot of manure I should like to have a sample of analysed on behalf of W. A. T. Amhurst, Esq., Didlington Hall (a member of the R.A.S.E.). May I request you to write me what your charges will be, and whether I may send it or not? It is sold at 5*l.* per ton, as a mixture of rape-cake, blood, and bones, for turnips. Will you give me an idea as to its value?

The following is the analysis of this substance:—

Moisture	27·08
Organic matter	20·32
Phosphate of lime	2·49
Oxide of iron and alumina	1·50
Carbonate of lime, &c.	15·58
Alkaline salts	1·72
Insoluble siliceous matter	31·31
	100·00
Nitrogen	·74
Equal to ammonia	·89

In sending this analysis to Mr. Wallis, Dr. Voelcker stated that he would think twice about it before he decided to buy such stuff, if it were offered to him, at 1*l.* 1*s.* a ton.

The following communication was received from Mr. Wallis, in answer to the usual inquiries:—

"Dear Sir,—I thank you very much for analysis received. I am sorry to say it is pretty much as I expected. I had hoped it would turn out better. I only purchased a small quantity from the maker. I have written him, enclosing copy of your analysis, and stating that I do not intend paying more than your valuation unless compelled, and claiming damages; I will let you know the result. I am not the only one bitten."

Subsequently Mr. Wallis wrote as follows:—

"Dear Sir,—The maker has receipted his bill for the manure you analysed for me, without payment. I had some trouble with him."

The maker's name is not published, simply because Mr. Wallis threatened to have it published unless the bill was receipted without payment. It was a Norwich production.

5. A sample of bone-dust, bought as pure ground bones, at 8*l.* a ton, was sent by Mr. George Rodger, Arden House, Altrincham. On analysis it yielded the following results:—

Moisture	22·45
*Organic matter	13·98
Phosphate of lime	13·75
Caustic lime	3·35
Carbonate of lime, &c.	27·11
Insoluble siliceous matter (sand and earth)	19·36
	100·00
*Containing nitrogen	1·02
Equal to Ammonia	1·24

This sample, it will be seen, was very damp and much adulterated with lime-rubbish, old mortar, sand, and brick-dust, and, in comparison with pure bone-dust selling at 8*l.* a ton, was scarcely worth 2*l.* a ton. No particulars as regards the vendors could be obtained.

6. A sample of artificial manure sent on May 18th by Mr. James Thompson, of Anlaby, Hull, was bought at 6*l*. 2*s*. 6*d*. on the following analysis :—

Analysis of Manure Ordered.

Moisture	11·3
*Organic matter and water of combination	21·1
Monocalcic phosphates	9·5
Equal to bone earth made soluble	(15 per cent.)
Nitrate of soda and potash	15·5
Insoluble phosphates	4·2
Sulphates of potash and magnesia	10·4
Sulphate of lime	24·0
Insoluble matter	3·0
	100·0

*Containing nitrogen equal to 6·3 per cent. sulphate of ammonia.

An examination of the sample sent yielded the following results :—

Analysis of Manure Received.

Moisture	16·38
*Organic matter and water of combination	25·60
Monobasic phosphate of lime	7·12
Equal to tribasic phosphate of lime (bone phosphates) rendered soluble	(11·15)
Insoluble phosphates	9·78
Sulphate of lime, alkaline salts and magnesia	26·45
Insoluble siliceous matter	14·67
	100·00

* Containing nitrogen	2·05
Equal to ammonia	2·49

An examination of the preceding analyses will show that 6*l*. 2*s*. 6*d*. is a fair price for a manure having the composition indicated in the analysis upon which the manure was purchased, while the sample analysed by Dr. Voelcker was not worth so much by at least 1*l*. 15*s*. per ton. In answer to inquiries, Mr. Thompson stated that his order of 8 tons of this manure was executed on May the 9th in Hull.

Mr. Thompson subsequently wrote to the Secretary as follows :—

"Anlaby, January 7th, 1880.

"Dear Sir,—In answer to your letter of Jan. 5th, I beg to inform you that the correspondence was given up at the time the account was paid. With regard to the payment, the price I paid for the manure was the price Dr. Voelcker stated it to be worth. I may say that when the matter came to be looked into, it was found that a wrong manure was sent to me from the works by mistake; and although Mr. —— personally superintended the putting up of my lot, yet he did not superintend the delivery of it. When the mistake was found out, it was too late to be remedied, as the greater part of the manure was then in the ground. This being so, it was agreed that I should pay the price put upon it by Dr. Voelcker, and so end the matter. As I believe this to have been purely a mistake, I must beg that if notice of this transaction appears in the 'Journal of the Royal Agricultural Society of England,' no names may be mentioned. In proof of it being my candid opinion that the manure sent to me was a mistake, I may say that it is my intention to purchase my turnip manure for this season from the same firm.

"Yours faithfully,
"Jos. Thompson.

"H. M. Jenkins, Esq.,
12, Hanover Square, London, W."

7. The following case was referred to Dr. Voelcker by Mr. Sanday, of Wensley House, Bedale, Yorkshire:—

Milk-Substitute for Rearing Calves and Pigs.

A cream-coloured meal, sold at 35*s.* per cwt., as a milk-substitute for rearing calves and pigs, and described in the handbills as a preparation consisting of "highly nutritious and flesh-forming substances" and "the most perfect soluble food in the world," on analysis was found to have the following composition:—

Moisture	20·35
Oil	·40
*Albuminous compounds (flesh-forming matters)	2·87
Starch and digestible fibre	74·85
Woody fibre (cellulose)	1·03
Mineral matter (ash)	·50
	100·00

* Containing nitrogen .. .. ·46

The meal appeared to have been kept in a rather damp place, for it contained more moisture than ought to be present in meal. It consisted almost entirely of starch—probably potato-starch—coloured slightly yellowish. It was very poor in nitrogenous or flesh-forming matters in which milk abounds, and was a most unsuitable substitute for milk in rearing calves and pigs.

The following is a copy of the handbill:—

"MILK SUBSTITUTE,
FOR REARING CALVES AND PIGS,
Manufactured only by
SPOUNCER AND SONS, GAINSBORO'.

"This preparation consists of highly nutritious and flesh-forming substances, and is the most perfect soluble food in the world.

"Almost every farmer admits that if his supply of milk were greater, he would rear more calves and pigs, and thus increase the number of his stock.

"It is an acknowledged fact that if a calf be given new milk until it is a fortnight old it can be well and properly reared on milk-substitute without the use of skimmed milk.

"As the substitute does not go sour and derange the stomach, the calf will not be so susceptible of scouring, but will, as a consequence, be more healthy."

The following is selected from a number of similar testimonials:—

"Grove Cottage, Lenton, Nottinghamshire,
August 7th, 1878.

"I am so well satisfied with your milk-substitute, should be glad if you will forward to me one of your 35*s.* bags to Lenton Station. I shall be glad to recommend it to my friends, feeling persuaded it is a most useful and economical substitute for milk, and am only sorry I did not hear of it earlier."

"DIRECTIONS FOR USE.—One measure of the powder to be mixed with cold water to the consistency of cream, then add three quarts of boiling water, stirring briskly all the time.

"Sold by agents throughout the Kingdom, in bags at 4*s.* 9*d.*, 9*s.* 3*d.*, and 18*s.* each, or 35*s.* per cwt.

"Agent—S. PARR, Pharmaceutical Chemist, Nottingham."

ADDITIONS TO THE LIBRARY IN 1879.

I.—PERIODICALS PRESENTED TO THE SOCIETY'S LIBRARY.

Presented by the respective Societies and Editors.

A.—ENGLISH, AMERICAN, AND COLONIAL PERIODICALS.

Agricultural Economist. Vol. X. 1879.
Agricultural Experiment Station, Middletown, Conn., Report of Work of the.
——— Gazette. 1879.
————— Almanack. 1880.
American Agriculturist. Vol. XXXVIII. 1879.
Athenæum. 1879.

Bath and West of England Society, Journal of the. Vol. XI. 1879.
Bell's Weekly Messenger. 1879.
Bristol Mercury. 1879.
British Dairy Farmers' Association, Journal of the. 1878.

Carolina, Handbook of North. 1879.
Chamber of Agriculture Journal. Vol. XX. 1879.
Coates's Herd Book. Vol. XXV. 1879.
Country Gentleman's Magazine. 1879.

Dairyman. Vol. III. 1879.

Economist. Vol. XXXVII. 1879.
Essex Standard. Vol. XLIX. 1879.

Farm Journal. 1879.

Farmer. Vols. XXXII. and XXXIII. 1879.
Farmer's Herald. Vol. XXVIII. 1879.
Field. Vols. LIII. and LIV. 1879.

Galloway Herd Book. Vols. I. and II. 1878–9.
Geological Society, Journal of the. Vol. XXXV. 1879.

Highland and Agricultural Society of Scotland, Transactions of the. Vol. XI. 1879.

Indian Agriculturist. Vol. IV. 1879.
Institution of Civil Engineers, Proceedings of the. 1878–9.
——— of Mechanical Engineers, Proceedings of the. 1879.
——— of Surveyors, Transactions of the. Vol. XI. 1879.
Investor's Monthly Manual. Vol. IX. 1879.
Irish Farmer's Gazette. Vol. XXXVIII. 1879.
Ironmonger. 1879.

Journal of Forestry. 1879.

Kansas, First Biennial Report of the State Board of Agriculture. 1877–78.

Live-Stock Journal. Vols. IX. and X. 1879.
Longhorn Herd Book. Vol. I.

Madras Presidency. Annual Report of the Superintendent of Government Farms. 1878.
Maine, Agriculture of. 1877–8.
——— Board of Agriculture. 1877–8.
Mark Lane Express and Agricultural Journal. Vol. XLVIII. 1879.
Massachussetts, Agriculture of, 1877–8.
Meteorological Society, Quarterly Journal of the. Vol. V. 1879.
Midland Counties' Herald. Vol. XLIII. 1879.

Nature. Vols. XIX. and XX. 1879.
Newcastle Courant. 1879.
North British Agriculturist. Vol. XXXI. 1879.

Ohio. Thirty-second Annual Report of the State Board of Agriculture for the year 1877.

Prairie Farmer. 1879.

Royal Geographical Society, Journal of the. 1879.
———, Proceedings of the. 1879.
Royal Institution of Great Britain. Vol. VIII. Parts V. and VI. 1879.
Royal United Service Institution, Journal of the. Vol. XXXIII. 1879.

Smithsonian Institution. Contributions to Knowledge. Vols. XIII.–XV. 1879.
Society of Arts, Journal of the. Vol. XXVII. 1879.
Statistical Society, Journal of the. Vol. XLII. Parts I.–IV. 1879.

Tasmania, Statistics of the Colony of. 1878.

Veterinarian, The. Vol. LII. 1879.

LIST OF FOREIGN PERIODICALS.

Berlin. Landwirthschaftliche Jahrbücher. Band VIII. 1879.
———. Landwirthschaftliche Verwaltung. 1875, 1876, 1877.
———. Journal für Landwirthschaft. 1878. Heft 4; and 1879, Hefte 1, 2, and Supplement.

Heidelberg. Verhandlungen des Naturhistorisch-Medicinischen Vereins. 1878–1879.
Lima. Revista de Agricultura. 1877.
Lisbon. Jornal de Sciencias Mathematicas physicas e Naturaes. 1879.
———. O Agricultor do Norte de Portugal. Vol. II. 5 Nos. 1879.
Montevideo. Boletin Oficial de la Comision Central de Agricultura del Uruguay. 2 Monthly Parts for 1878; 6 Monthly Parts for 1879.
Munich. Zeitschrift des Landwirthschaftlichen Vereins in Bayern. 1878.
Paris. Annales Agronomiques. Tome quatrième. Fasc. 1–4. 1879.
——. Revue des Industries Chimiques et Agricoles. 12 Nos. 1879.
——. Revue Agricole, Industrielle, Littéraire et Artistique. 1879.
——. Journal d'Agriculture Pratique. 1879.
——. Journal de l'Agriculture. 1879.
——. Société des Agriculteurs de France. Tomes IX. and X. 1878 and 1879.
Rome. Annali di Agricoltura. 7 Parts. 1879.
———. Bollettino di Natizie Agrarie. 12 Nos. 1879.
Valencia. Revista Mensual de la Sociedad de Agricultura. Vol. XV. No. I. April, 1878.

II.—BOOKS PRESENTED TO THE SOCIETY'S LIBRARY.

Names of Donors in Italics.

A. English, American, and Colonial Books and Pamphlets.

Atwater, Prof. W. O. (New York). Resumé of Progress in Agricultural Science in 1878.
Bagot, Canon (and *James Robertson*). Report on Continental Butter Making.
Benson, Charles. Saidapet Experimental Farm.
Bruce, James. Scotch Live Stock.
Buckman, Prof. J. Umbellate Plants, with notes on the Growth of the Parsnip, Carrot, &c.
Cowie, James. Farm Buildings. Past, and Present.
————. A Sketch of Seasons, Crops, and Prices from Early Times.
Gibson, J. Agriculture in Wales.
Hagen, Dr. H. A. Destruction of Obnoxious Insects.
Hubback, Joseph. A Letter on the Corn Laws.
Jones, W. Bence. Notes on the Dairies at the Kilburn Show, 1879.
Lawes and Gilbert. Agricultural, Botanical, and Chemical Results of Experiments on the Mixed Herbage of Permanent Meadow, conducted for more than 20 years in succession on the same land.
Latham, Baldwin. Sanitary Engineering.
Mueller, Baron Ferd. von. The Organic Constituents of Plants and Vegetable Substances.
Murray, Gilbert. Agricultural Depression: its Causes and Remedies.
————. Notes on Dairy Farming.
Nesbit, A. Anthony, F.C.S. Soils.
Rance, Charles E. De. The Secondary Rocks of England, as a Source of Water Supply.
Riley, C. V. The Locust or Grasshopper Plague.
Shirriff, Samuel D. Address on Labour.
Sturtevant, Dr. E. Lewis. The Dairy Cow. Chemical Corn Growing. Indian Corn. Intercultural Tillage. Milk: Physiological and Miscel-

laneous. Milk: its Typal Relations. Seed Breeding. The Law of Inheritance. Plant Food and Agriculture. Physiological Considerations concerning Feeding for Butter and Cheese.

Tanner, Prof. Jack's Education; or, How he learnt Farming.

————. Variations in the Composition of Oats.

Waring, George E., Jun. Fiske Fund Prize Essay on the Causation of Typhoid Fever. Excremental Diseases; their Causation and their Prevention by Hygienic Means. Irvington Sanitary Survey.

Wight, John. The Treasury and Homestead.

B. FOREIGN BOOKS AND PAMPHLETS.

Bombay. Notes on the Agriculturists of the District of Aurungabad.

Paris. Congres International de l'Agriculture:—

Godfroy, J. Economie rurale du Danemark. 1878.
Laveleye, Émile de. L'Agriculture Belge. 1878.
Martinet, J. B. H. L'Agriculture au Pérou. 1878.
Mérice, E. L'Agriculture de l'Écosse et de l'Irlande. 1878.
Sagnier, H. L'Agriculture en Italie. 1878.
Tréhonnais, F. R. de la. L'Agriculture de l'Angleterre. 1878.
Valette, A. de la. L'Agriculture à la Guadeloupe. 1878.

(*The above works were published and presented by the 'Société des Agriculteurs de France.'*)

Paris. Manuel de la Porcherie. *L. Leouzon,* 1879.

Rome. Museo Agrario in Roma. Catalogo, 1879. (*Presented by the Italian Minister of Agriculture, Industry, and Commerce.*)

——. Notizie e Studi sulla Agricoltura (1877). 1879. (*Presented by the Italian Minister of Agriculture, Industry, and Commerce.*)

——. La Laine Italiane alla Esposizione di Parigi nel 1878. 1878. (*Presented by the Director of Agriculture.*)

JOURNAL

OF THE

ROYAL AGRICULTURAL SOCIETY OF ENGLAND.

XX.—*On the Home Produce, Imports, Consumption, and Price of Wheat, over* 28 (*or* 27) *Harvest-Years*, 1852–3 *to* 1879–80.

By J. B. Lawes, LL.D., F.R.S., F.C.S., and J. H. Gilbert, Ph.D., F.R.S., F.C.S.

In our paper "On the Home Produce, Imports and Consumption of Wheat," published in this 'Journal' in 1868, we gave records and estimates on the subject for sixteen harvest-years, 1852–3 to 1867–8 inclusive; and in 1863, and each year since, an estimate for the then current year has been published in the 'Times,' and elsewhere, soon after harvest. We propose, on the present occasion, to pass in review the estimates formerly given, and to complete the record from the commencement up to the present time; namely, for twenty-eight (or twenty-seven) years, 1852–3 to 1879–80 inclusive. In our former paper we gave the records and estimates for each division of the United Kingdom separately, and for the whole collectively; but it is proposed now to confine the illustrations to the United Kingdom as a whole.

The main elements of the question are the following:—

1. The area under wheat.
2. The average yield of wheat per acre.
3. The aggregate home produce, and the amount of it available for consumption.
4. The imports.
5. The population.
6. The average consumption of wheat per head of the population per annum.

The data then at command, and the results arrived at, were fully considered in the paper above mentioned, and we must refer to it for detailed information on most of the points in question, but the main facts may be briefly summarised here.

The Area under Wheat.—For the period from 1852 to 1865 inclusive, we had to rely on estimates alone in fixing the area under the crop in England and Wales. For Scotland, we had Returns collected by the Highland Society for the years 1854, 1855, 1856, and 1857; but for the two years prior to 1854, and for the years subsequent to 1857, down to 1865 inclusive, we had to rely on estimates merely. For Ireland, Returns were available for each of the sixteen years included in the inquiry. Thanks to the exertions of Mr. Caird, we have for 1866, and for each year since, an official record of the area under the crop, in each division of the United Kingdom, and in the whole collectively, in the 'Agricultural Returns' now annually published about the time of harvest. One element of uncertainty in any estimates of the home produce of wheat is, therefore, fortunately removed.

The Average Yield of Wheat per Acre.—The only Returns or official estimates at command relating to this subject, were for Scotland for four years, and for Ireland for each year within the period of our inquiry; whilst, for England and Wales, comprising from 85 to 90 per cent. of the total area under the crop, there was, and there is, no official information whatever. For this large proportion of the United Kingdom it was therefore, after very full consideration of the data, and of the results to which they led, decided to adopt the average produce per acre each year, on certain selected, and very differently manured plots, in the permanent experimental wheat-field at Rothamsted, as the basis of estimates of the average produce per acre from year to year; and, each year since, the same data have been relied upon in forming an estimate of the average produce over the United Kingdom as a whole. But, having regard to the character of the soil at Rothamsted, to the characters of the individual seasons, and to the consideration whether the season was more favourable for heavy or for light land, and so on, the estimate actually adopted for the country at large has, in some seasons, and more especially in bad seasons, differed somewhat from the actual average indicated on the selected plots in the experimental field. Lastly, in all cases, the actual number of bushels is reduced by calculation, so as to represent bushels of the standard weight of 61 lbs. per bushel.

It is proposed, on the present occasion, briefly to examine into the validity of the data thus taken as a basis for estimating the average yield per acre of the country each year, and also into the trustworthiness of the results arrived at, as tested by subsequent knowledge, and by their accordance, or otherwise, with the conclusions arrived at in regard to other elements of the question.

The Aggregate Home Produce, and the Amount of it available for Consumption.—It will be obvious that, if we know the area under the crop, and have a trustworthy estimate of the average yield per acre, the aggregate home produce is ascertained by a very simple calculation. In determining the amount of the total produce available for consumption, allowance has to be made for the amount annually returned to the land as seed. For reasons formerly given, we have assumed 2¼ bushels per acre to be so returned to the land, and we do not propose to make any alteration in that estimate.

The Imports.—From the commencement of the period to which our inquiry relates we have, for the United Kingdom collectively, Returns, either of the net imports of wheat and wheat-flour, or of the imports and exports from which the net imports can be calculated. For the separate divisions of the country the Returns have not been so complete. But, as we are confining attention to the United Kingdom as a whole, this is immaterial for our present purpose. In the case of the United Kingdom, the records for the individual weeks or months are available; and from these the net imports have been calculated, not for the calendar years, but for the *harvest years*, that is, from September 1 of one year, to August 31 of the next.

The Population.—As the Registrar-General publishes an estimate of the population at the middle of the calendar year, for every year between one Census and another, it is easy to calculate, with sufficient accuracy for our purpose, the average number of consumers over each harvest-year. The middle of the calendar year being the end of June, and the middle of the harvest-year the end of February, the plan adopted has been to add to the number recorded for the preceding midsummer, two-thirds of the difference between that figure and the number given for the next midsummer, thus bringing the estimate up to the end of February. Of course, this can only be done after the second record is published, and the plan was not available in estimating the population of the current harvest-year soon after harvest each year; but the necessary corrections have now been made. The figures show some irregularity of increase immediately after the Census years, and at some other periods, presumably from a new factor being then adopted for the calculation of the annual increase of the population.

The Average Consumption of Wheat per head of the Population per Annum.—Previously to the publication of our former paper on this subject, a higher figure had been generally assumed than we were then led to adopt. For England and Wales, we founded an estimate of the average consumption per head of the population, on the calculation of eighty-six different dietaries, arranged in fifteen divisions, according to sex, age, activity of mode of life, and other circumstances; and the result so obtained was compared with that arrived at on the basis of the population, and of the amounts of the available home produce, and of the net imports of wheat, each year. For Scotland, and for Ireland, it was only possible to found an estimate on the basis of population, and on the amounts of the home and foreign supplies. On these bases we estimated the average consumption of wheat, in the United Kingdom collectively, to be 5½ bushels per head of the population per annum, during the later years to which our inquiry related; and we have adopted that figure from that date up to the present time. This estimate, whether correct or not, has from that time been very generally adopted by other writers on the subject also. Its correctness, and its continued applicability, we propose to consider on the present occasion.

Thus, with regard to the area under the crop, the imports, and the population, we adopt, without modification, the same data or estimates as previously ; but the basis of the estimates, and the results arrived at, in regard to the average produce of wheat per acre over the United Kingdom each year, and the estimates of the consumption per head of the population, we propose to submit to examination, and to correction or otherwise, as the case may be.

As already said, the estimate of the *average yield of wheat per acre* over the United Kingdom is, each year, founded on the average produce obtained on certain selected plots in the field at Rothamsted, which has now grown the crop for thirty-six years in succession—without manure, with farmyard-manure, and with various artificial manures. There has been no change in the treatment of the unmanured plot, or of the dunged plot, since the commencement of the experiments in 1843–4. There were, however, some changes in the manures applied to the various artificially manured plots during the first eight years, from 1844 to 1851 inclusive. But, for the period of twenty-eight years, from 1852 up to the present time, two of the selected artificially-manured plots have respectively received exactly the same manure each year, and the third has done so for twenty-five years, as described below. The selected plots were—

Plot 3. Unmanured every year, experiment commencing 1843–4.

Plot 2. 14 tons farmyard-manure every year, commencing 1843–4.

Plot 7. Mixed mineral manure, and 400 lbs. ammonia-salts, each year, twenty-eight years, 1851–2, and since.

Plot 8. Mixed mineral manure, and 600 lbs. ammonia-salts each year, twenty-eight years, 1851–2, and since.

Plot 9. Mixed mineral manure, and 550 lbs. nitrate of soda, each year, twenty-five years, 1854–5, and since.

In forming the estimate of the average produce per acre of the country at large, the plan adopted has been to take the mean produce of the unmanured plot, of the farmyard-manure plot, and of the three artificially manured plots reckoned as one, and to reduce the result so obtained to bushels of the standard weight of 61 lbs. per bushel. As will be shown further on, experience has proved that this mode of estimate leaves but little to be desired as a means of computation of the average yield of the country over a number of years; but it has not been found to be equally applicable for each individual year. Careful comparison leads to the conclusion that the so-calculated average produce per acre on the selected plots gives somewhat too high a result for the country at large in seasons of great abundance, and too low a result in unfavourable seasons. Accordingly, as above referred to, in some seasons, instead of the actual average indicated by the experimental plots, a higher or a lower figure has been adopted; and, especially in the case of some of the recent bad seasons, a higher one has been taken.

Independently of any such admitted differences between the so directly calculated, and the actually adopted, estimates for individual years, the question arises—whether the average result indicated by the several selected plots remains as applicable as heretofore? or whether the produce of some is annually declining, or that of others annually increasing, irrespectively of the influence of season, so as to vitiate the continued applicability of such results for the purposes of such an estimate?

The Unmanured Plot.—There can be no doubt that the produce on this plot is gradually declining from exhaustion; and, independently of the evidence of diminishing produce, analyses of the soil, at different periods, show that there is a gradual diminution in the amount of nitrogen in it. Owing, however, to the great fluctuations in the amount of produce from year to year, dependent on the season, it is by no means easy to estimate the rate of decline due to exhaustion of the soil, as distinguished from that due to the seasons. In the first place, it is difficult to say what figure should be adopted as the standard produce of the plot, by which to compare the yield from year to year. The whole field was manured with farmyard-dung in 1839, and then grew turnips, barley, peas, wheat, and oats, before the commencement of the experiments in 1843–4. The plot then grew eight crops of wheat, to 1850–1, without manure, before the commencement of the period to which our present estimates refer. No doubt the land would suffer more or less exhaustion during those first eight years; but, as serving to counteract the tendency to decline in yield from that cause, it happened that, taken together, those eight seasons were of considerably more than average productiveness; so that, perhaps, we may assume the average produce of those eight years fairly to represent the standard produce of the unmanured land independently of material exhaustion. That produce was equal to 17 bushels, at the standard weight of 61 lbs. per bushel. If now we calculate what should be the produce in each of the subsequent twenty-eight years, on the assumption that it fluctuated from the standard exactly in the proportion of the fluctuation from year to year of the adopted average yield of the country at large, and compare the result so obtained with the actual yield of the plot each year, we find that the latter shows an average annual deficiency over the twenty-eight years of 4⅜ bushels. According to this mode of calculation, therefore, this represents the decline of produce on the unmanured plot, irrespectively of season; and it may be observed that, supposing it to be uniform over the whole period, it would correspond to a rate of diminution, due to exhaustion, of between one-quarter and one-third of a bushel from year to year. It remains to be seen whether, with a return of good seasons, the decline will be as marked; and also whether, in time, a point will be reached at which the produce will remain constant, excepting so far as it is influenced by the fluctuations of the seasons.

The Farmyard-manure Plot.—If the unmanured plot is declining in yield and fertility, there can be no doubt that the farmyard-manure plot is increasing in fertility. Analysis at different periods shows that the surface soil has become more than twice as rich in nitrogen as the unmanured land. In fact, as we have shown on several occasions, a large amount of the constituents of farmyard-manure accumulates within the soil, and they are taken up very slowly by crops. It is, indeed, remarkable that, notwithstanding this great accumulation within the soil, the crops on the dunged plot never show over-luxuriance. During the last few years there has even been a considerable decline in produce, due to unfavourable seasons, which have greatly encouraged the growth of weeds, and especially of grass; whilst, owing to the wetness of the seasons, it has been quite impossible effectually to clean the land, and what has been done to that end has not been accomplished without injury to the crop.

If, as in the case of the unmanured plot, we were to adopt the average of the first eight years, from 1844 to 1851, to represent the standard yield of the farmyard-manure plot, irrespectively of material accumulation, the figure arrived at would be 28⅛ bushels. This is certainly a surprisingly low produce to be obtained by the annual application of 14 tons of farmyard-manure per acre, for eight years in succession, and in seasons which, taken together, were of more than average productiveness. But if we adopt this as the standard produce of the plot; then calculate what should be the produce in each of the subsequent twenty-eight years, provided it fluctuated from year to year exactly in the same degree as the average produce of the country at large; and then take the difference between this calculated produce fluctuating by season alone, and that actually obtained each year, we ascertain the increase or decrease due to accumulation by manure. On this mode of calculation we get an average annual increase due to accumulation of 5¼ bushels. If, on the other hand, instead of the average produce of the first eight years, we take the average of the whole thirty-six years of the application of the dung, we get, instead of 28⅛ bushels, 32⅛ bushels, as the standard with which to compare the annual produce. Adopting this figure, and following the same line of calculation as before to exclude the influence of season, we have an average annual excess, due to accumulation, of only 1¼ bushel. There can be no doubt that, were it not for the adverse influence of the recent wet seasons, the estimated excess would be more than 5¼ bushels adopting the first standard, and more than 1¼ bushel adopting the second. Probably the truth lies between these two figures: and, if so, it would appear that, up to the present time at any rate, the gradually diminishing produce on the unmanured plot, due to exhaustion, and the gradually increasing produce on the dunged plot, due to accumulation, approximately balance one another.

The Artificially-manured Plots.—Though obviously open to objection, in default of any better alternative, we adopt for these plots the average produce of the twenty-eight (or twenty-five) years to represent the standard yield, irrespectively of exhaustion or accumulation. Doing this, and excluding the influence of season by the same line of calculation as before, there is no evidence of material increase, or of material decrease, on either of the plots receiving ammonia-salts, other than that due to season. The first fourteen of the twenty-eight years included a number of seasons of unusually high productiveness, and the last fourteen a number of unusual deficiency. The calculations show, accordingly, an excess over the assumed standard produce during the first half of the period, and a closely corresponding deficiency over the second half, in both the cases where ammonia-salts were used. Where the nitrate of soda was employed, there was, on the other hand, a somewhat greater deficiency over the first period than there was an excess over the second, indicating for the total period a slight deficiency.

Finally, taking the average of the unmanured plot, of the farmyard-manure plot, and of the three artificially manured plots reckoned as one, as is annually done for the purpose of our estimate; then correcting the result for each year as before, for the fluctuations of season; and comparing the results so obtained with the actual averages, the actual results show a very slight excess over the first half of the period, including more than an average of good seasons, and a somewhat greater, but still small, deficiency over the second period, including more than the average of bad seasons. The average of the whole indicates, therefore, no gain by accumulation, but, if anything, a slight loss.

Comparing the direct average of the experimental plots with that actually adopted as the average for the United Kingdom each year, the experimental plots indicate for the whole twenty-eight years about three-quarters of a bushel less per acre per annum than the actually adopted estimates founded upon them.

Taking the average of the twenty-eight years' adopted estimate of produce per acre as 100, the first column of the following Table shows the deviation from this general average for the whole period, over the first eight, the second eight, the third eight, and the last four, years of the twenty-eight; and the second column shows the deviation, from the same standard, of the average produce per acre on the selected plots:—

TABLE I.—SHOWING the DEVIATION over each separate Period from the adopted AVERAGE of the whole PERIOD taken as 100.

	Actually adopted Averages.	Averages of Plots, 3, 2, and 7, 8, and 9.
First 8 years, 1852-59	103	101
Second 8 years, 1860-67 ..	104	106
Third 8 years, 1868-75 ..	98	99
Last 4 years, 1876-79	89	71
Total Period 28 years..	100	98

So far as the annually adopted estimates are correct, the figures in the first column indicate the actual fluctuations in the average produce per acre of the country at large due to the characters of the seasons over each period compared with the others, and with the total period.

The first period of eight years included two of considerably over average, another over average, three rather under, and two very much under average. The result was, however, upon the whole slightly over the average of the twenty-eight years. The adopted average produce showed 3 per cent. over the average of the twenty-eight years, and 2 per cent. over the actual average on the selected plots—a higher figure than the actual average having been adopted in the case of the two years of very low produce.

Within the second period of eight years, there were two of the highest yield over the twenty-eight years, two more somewhat over average, two under, and two much under average. In this period highly productive seasons prevailed; the adopted average is 4 per cent. over the average of the twenty-eight years, and the actual average on the selected plots is 6 per cent. over, or 2 per cent. higher than the adopted average.

In the third period of eight years there was only one of really high produce, two more were over average, one was under, and four were considerably under average; the mean of the whole being under average. The adopted average for the period shows 2 per cent. under the average of the twenty-eight years, whilst the average of the experimental plots shows 1 per cent. under the average.

The last four years included only one over average, two under, and one (1879) very abnormally under average. Over this period, the adopted average amounted to only 89 per cent. of that for the twenty-eight years; and, with the unusual prevalence of bad seasons, the experimental plots showed only 71 per cent., or much lower than the adopted average.

Thus, it appears that, in fairly average seasons, the mean produce of the experimental plots fairly represents the average produce; that in seasons of unusual abundance the experimental plots indicate too high a figure; and that in seasons of great deficiency they give too low a figure. Upon the whole, it is concluded that we have no better basis for estimating the average yield of the country each year than that of the average produce of the same selected plots as heretofore relied upon; but that, as heretofore, some judgment must be exercised each year, according to the characters of the season, in deciding whether to adopt the actual figure indicated by the experimental plots, or in which direction, and in what degree, it should be modified. It will, moreover, have to be considered from time to time, whether any reduction of area that may take place is in greater degree due to the elimination of districts where the soil, or the climate, or the combination of the two, is the less, or the more, favourable for the crop; for it is obvious that, other things being equal, the average produce per acre of the remaining area will increase or diminish accordingly.

The next point is to test, as far as the means exist to that end, the correctness of the estimates of the aggregate home produce, and of the consumption per head per annum, as given in our former paper for the first sixteen years, and as annually published as forecasts since that period.

In our annual estimates we have adopted a figure for the average produce per acre over the United Kingdom, calculated the aggregate produce, deducted from this the amount required for seed, and then estimated how much would be required, from stocks and imports, to make up the total requirement for consumption, this being reckoned at a fixed rate per head of the population. Now, however, we have the actual record of the imports each year, as a fixed element of the inquiry; and, adopting the same returns or estimates as to area and population as heretofore, the question now is—not what will be the imports, but how far the estimates of home produce have been correct? and how far these estimated amounts, minus the quantities required for seed, and plus the actual imports, give a total corresponding with the estimated requirement for consumption?

The following Table shows the averages, for the first eight, for the second eight, for the third eight, for the succeeding three, and for the total period of twenty-seven years, of—

1. The aggregate home produce of wheat, deduced by calculating the amount required for consumption (at the rate of 5·1 bushels per head per annum during the first eight years, and of 5·5 bushels in each subsequent year, as up to this time assumed), deducting from this the imports, and adding 2¼ bushels per acre for seed.

2. The aggregate home produce calculated according to the annual estimates of the average produce per acre, as previously published.

3. The difference between the estimate of total home produce founded on consumption and imports, and that founded on the annually adopted estimates of average produce per acre.

4. The average produce per acre, calculated from the aggregate home produce founded on the estimated requirements for consumption, and the imports.

5. The average produce per acre, according to the annually adopted estimates.

6. The difference between the average produce per acre calculated from the aggregate home produce deduced from consumption and imports, and the annually adopted estimates of average produce per acre.

TABLE II.—COMPARING the ESTIMATES of HOME PRODUCE founded on requirements for CONSUMPTION and IMPORTS, with those founded on the annually adopted ESTIMATES of AVERAGE PRODUCE per ACRE, over the UNITED KINGDOM.

	Aggregate Home Produce.			Average Produce per Acre.		
	Deduced from calculated requirements for Consumption and Imports.	According to Annually adopted Estimates of Average Produce per Acre.	Annually Estimated, + or − calculated according to requirements, &c.	According to Consumption and Imports.	According to Annually adopted Estimates.	Annual Estimate + or − Calculated.
Averages for—	Quarters.	Quarters.	Quarters.	Bushels.	Bushels.	Bushels.
8 Years, 1852–59	14,390,956	14,310,779	− 80,177	28⅛	28	− 0⅛
8 Years, 1860–67	13,312,217	13,309,247	− 2,970	28⅜	28⅜	0
8 Years, 1868–75	12,174,772	12,699,155	+ 524,383	25⅝	26¾	+ 1⅛
3 Years, 1876–78	10,393,500	11,166,910	+ 773,410	25½	27¼	+ 1¾
27 Years, 1852–'78	12,970,521	13,181,636	+ 211,115	27¼	27⅝	+ 0⅜

Leaving out of view for the present any consideration of the inevitable discrepancies which must appear between the results of these two modes of estimate for individual years, it is obvious that, whether we compare the aggregate home produce founded on the requirements for consumption and on imports, with that founded on the annually adopted estimates of produce per acre, or compare the estimated average produce per acre itself arrived at in the two different ways, there is, taking the average of the twenty-seven years, comparatively little difference between the results thus variously arrived at. The annually adopted estimates of produce per acre over the United Kingdom give, however, the higher result.

It is obvious that, to bring out still more close conformity of result from the two modes of estimate, we must either raise the estimate of requirement for consumption per head, or lower that of the average produce per acre over the United Kingdom for some of the years. Unfortunately, we have little else than judgment to aid us in deciding between these two alternatives. If, however, we compare the average result by the two methods for shorter periods—for the first, for the second, for the third eight years, and for the last three years, of the twenty-seven, for example—it is seen that the results of the two estimates agree very closely indeed for the first two periods of eight years each; but that, for the third and fourth periods, those founded on the requirements for consumption and the imports are considerably lower than the average of the annually adopted estimates for those periods. The fact is that, for each of the first two periods, the estimated consumption was itself finally founded on the estimated home produce and the imports of the periods; so that, although there will be discrepancy in the results arrived at in the two ways for individual years, there could not be material disagreement over the whole of either of those periods. For each of the last two periods, however, the estimate of consumption per head has been annually adopted independently, as forecasts, and the discrepancy between the results of the two modes of estimate for those periods has, therefore, a real significance.

Independently of the question of whether or not any correction in the estimates for individual years should be made, the foregoing results would lead to the conclusion that the actual consumption per head, taken together with the amount consumed by stock, has been greater over the last two periods than has been annually assumed. If now we assume the requirement per head to have been 5·6 bushels over the third eight years, and 5·65 bushels over the last three years, instead of, as previously, 5·5 bushels over those eleven years, this would bring the two estimates into very much closer agreement. We should then have the average produce per acre per annum, over the United Kingdom, for the respective periods as follows:—

TABLE III.

	Average Produce per Acre.	
	According to increased Consumption, and Imports.	According to Annually adopted Estimates.
	Bushels.	Bushels.
Average 8 years, 1852-3—1859-60 ..	28⅛	28
Average 8 years, 1860-1—1867-8 ..	28⅜	28⅜
Average 8 years, 1868-9—1875-6 ..	26½	26¾
Average 3 years, 1876-7—1878-9 ..	27	27¼
Average 27 years, 1852-3—1878-9	27⅜	27⅝

It will be observed that, even with the estimates of the average consumption per head raised as above supposed, the average produce per acre founded on the annual estimates is slightly higher over the last two periods than that founded on consumption and imports. It must be borne in mind that the quantity of wheat consumed by farm-stock is an unknown and varying element; and either the estimate of the consumption per head of the population must be fixed to include the average consumption in other ways, or the annual estimates of produce per acre, and of the aggregate home produce founded upon them, should exceed those founded on consumption and imports. It may be remarked that an increase of one-tenth of a bushel in the consumption per head per annum would, if derived from home produce, represent an increase of one bushel per acre per annum over the United Kingdom, assuming a population of 33,000,000, and an area under the crop of 3,300,000 acres; figures which closely represented the actual facts a very few years ago. It is obvious that, with an increasing population, and a diminishing area under wheat, such an assumed increase in consumption per head would correspond to more than a bushel per acre.

Table IV. (over-leaf) shows the amount of home produce required for consumption within each harvest-year, as calculated by deducting the imports from the estimated total requirement for consumption, adopting the increased estimates of consumption per head, as above assumed, for the last eleven years; and, for comparison with the result so obtained, there is given the amount of home produce available for consumption each year, according to the annual estimates of the average produce per acre, with 2¼ bushels per acre deducted for seed. The difference between the two is shown in the last column.

When it is borne in mind that the first estimate (Col. 4) represents the requirement alone each year, and the second (Col. 5) the amount available for consumption from the estimated actual crop each year, it will be obvious that agreement between the two estimates for individual years is not to be expected. The amounts carried over from one harvest year to another will, of course, vary exceedingly according to circumstances, the influence of which cannot with any certainty be estimated. We have, for example, no reliable information as to the quantity of home-produced wheat held in the farmer's hands, the quantity consumed by farm-stock, or otherwise used, or the quantity of foreign wheat held over in the granaries. Then, again, the actual length of the period to be provided for, dependent on the earliness or the lateness of consecutive harvests, has to be taken into account.

Referring to the actual differences for individual years, as shown by the figures in the last column of the Table (IV.), it is obvious that, whilst there may be, and frequently is, an excess of wheat available over that required for consumption within the harvest-year, there cannot be an actual deficiency. Without attempting to account for each individual difference, it may be observed that the deficiencies which the figures indicate in some of the earlier years would doubtless be compensated, at any rate in part, if the balance were brought forward from t

TABLE IV.

Harvest Years; September 1, to August 31.	Total required for Consumption; at 5·1 bush. 1st 8 Years, at 5·5 bush. 2nd 8 Years, at 5·6 bush. 3rd 8 Years, at 5·65 bush. last 4 Years, per head per Annum.	Imports.	Difference; required from Home Produce within each Harvest Year.	Home Produce available for Consumption according to Annual Estimates of Average Produce per Acre (2¼ bushels per Acre deducted for Seed).	Available Home Produce according to Annual Estimates + or − calculated requirement within each Harvest Year.
	Quarters.	Quarters.	Quarters.	Quarters.	Quarters.
1852-3	17,538,354	5,902,000	11,636,354	10,433,464	− 1,202,890
1853-4	17,607,749	6,092,000	11,515,749	9,337,546	− 2,178,203
1854-5	17,701,710	2,983,000	14,718,710	16,427,742	+ 1,709,032
1855-6	17,816,807	3,265,000	14,551,807	12,776,300	− 1,775,507
1856-7	17,932,364	4,112,584	13,819,780	13,007,453	− 812,327
1857-8	18,055,662	5,795,687	12,259,975	16,143,915	+ 3,883,940
1858-9	18,183,671	4,555,670	13,628,001	15,147,874	+ 1,519,873
1859-60	18,306,247	4,516,332	13,789,915	12,004,575	− 1,785,340
1860-1	19,874,968	10,023,968	9,851,000	9,956,012	+ 105,012
1861-2	20,025,576	9,099,455	10,926,121	11,175,183	+ 249,062
1862-3	20,165,540	9,205,086	10,960,454	12,882,069	+ 1,921,615
1863-4	20,287,594	6,991,270	13,296,324	16,881,807	+ 3,585,483
1864-5	20,419,321	5,500,705	14,918,616	15,179,783	+ 261,167
1865-6	20,547,130	7,313,026	13,234,104	12,950,305	− 283,799
1866-7	20,684,813	7,633,033	13,051,780	10,458,645	− 2,593,135
1867-8	20,830,600	9,015,543	11,815,057	8,545,890	− 3,269,167
1868-9	21,368,178	8,243,389	13,124,789	15,626,060	+ 2,501,271
1869-70	21,532,105	10,000,004	11,532,101	12,301,205	+ 769,104
1870-1	21,909,347	8,841,090	13,068,257	13,089,893	+ 21,636
1871-2	22,224,385	9,316,600	12,907,785	10,382,493	− 2,525,292
1872-3	22,428,445	12,291,463	10,136,982	10,438,729	+ 301,747
1873-4	22,622,952	11,583,645	11,039,307	9,290,343	− 1,748,964
1874-5	22,840,258	11,739,710	11,100,548	12,898,085	+ 1,797,537
1875-6	23,082,333	13,948,644	9,133,689	9,033,000	− 100,689
1876-7	23,537,495	12,158,006	11,379,489	8,857,015	− 2,522,474
1877-8	23,826,133	14,511,181	9,314,952	10,039,073	+ 724,121
1878-9	24,058,216	14,431,971	9,626,245	11,698,672	+ 2,072,427
1879-80	(24,334,025)	..	..	(5,047,840)	..

AVERAGES.

8 Years, 1852-'59	17,892,820	4,652,784	13,240,036	13,159,859	− 80,177
8 Years, 1860-'67	20,354,443	8,097,761	12,256,682	12,253,711	− 2,971
8 Years, 1868-'75	22,251,000	10,745,568	11,505,432	11,632,476	+ 127,044
3 Years, 1876-'78	23,807,281	13,700,386	10,106,895	10,198,253	+ 91,858
27 Years, 1852-'78	20,570,665	8,484,076	12,086,589	12,109,746	+ 23,157

immediately preceding years, the last three of which were seasons of more than average productiveness, and of lower than average price, conditions which imply abundance. Then as to some of the excesses. It may be mentioned in illustration that, in each of the four consecutive years 1862, 3, 4, and 5, there was more, and in two of them very much more, than the average produce over the country at large; and it was estimated that, at the harvest of 1865, there still remained over from the extraordinary crop of 1863, and the abundant one of 1864, wheat equal to from one-third to one-half of an average crop; and that, even at the harvest of 1866, some of the crop of 1863 remained unthrashed. It may, indeed, be stated generally, that as a rule the excesses follow, as they should, seasons of high productiveness, and the deficiencies seasons of low productiveness.

Discrepancies between the two results for individual years are, in fact, inevitable; and the figures strikingly illustrate the difficulty of the subject, so far as individual years are concerned. But if the bases of the estimates are correct, the results of the two methods should agree when averaged over a sufficient number of years. An examination of the averages for the different periods, given at the foot of the table, will show that, with the increased estimates of consumption per head for the last two periods, the agreement between the differently obtained results is really very close.

Finally, as to the questions—whether our previous estimates of the consumption of wheat per head of the population, over the first two periods of eight years each, are correct? and whether we are to conclude that there really has been an increased consumption per head in the subsequent years?

There can be no doubt that the average consumption per head has increased in the United Kingdom as a whole since the establishment of free trade in corn; and there can be but little doubt that it has done so less rapidly during the later, than during the earlier, years since that change. This will be the case, at any rate, with the much larger proportion of the total population which is comprised within England and Wales; though the increased consumption has probably been developed later in Scotland, and perhaps in Ireland also. The amount consumed will obviously vary according to the prosperity or otherwise of the people, to the price of wheat itself, and to that of other articles of food also. With regard to the price of wheat, barring exceptional cases, there has been a general tendency to decline throughout the period to which our estimates refer. Independently of the influence of lower prices, and of the increased prosperity of the masses of the population, among the circumstances tending to increase the consumption of wheat in recent years may be mentioned the increased price of meat; whilst, among those tending to limit the rate of increase of consumption may be noted the fact that the proportion of the total wheat consumed which is derived from foreign sources is rapidly increasing, and the drier foreign wheats will undoubtedly yield a larger percentage of flour, and flour of better quality, than much of the home-grown grain.

As already explained, the estimates of consumption per head over the first sixteen years, although controlled by the calculation of numerous dietaries, were finally founded on the estimated amounts of home produce and the ascertained amounts of the imports; and they were calculated for the first half, and the second half of that period separately, in order to ascertain whether or not an increased rate of consumption were indicated. The result was that the so reckoned available supplies showed a consumption of about 5·1 bushels per head per annum over the first eight years, and of 5·5 bushels over the second eight years. Of course, even supposing that the estimates of the available supplies over the whole period were correct, and that there was a considerable increase in the rate of consumption during the period, it is not to be assumed that there was the sudden rise from the first to the second eight years, which taking the averages over those separate periods shows. It is, indeed, doubtful whether the estimates of consumption per head over the earlier years, as deduced from the amounts estimated to be available from the home produce and the imports, may not be somewhat too low, due to an under-estimate of the area under the crop in those years. But, as no data exist upon which to base a trustworthy correction, the safer alternative seems to be simply to call attention to this probability.

Then, again, a careful consideration of our annual estimates of produce per acre subsequent to the first sixteen years, leads to the conclusion that some are more probably too low than too high. For 1866 and 1867, for example, our own estimates are lower than those of some others; and that for 1867, at any rate, may we think probably be somewhat too low. But here, again, there is lack of sufficient evidence to justify an alteration.

Upon the whole, we are disposed to conclude that our estimates of consumption per head during the first period of eight years may be somewhat too low. We also conclude that our previously published estimates of consumption for the years subsequent to the first sixteen, are more probably too low, than that our estimates of average produce per acre, and of aggregate produce founded upon them, are too high. For the reasons given, however, we adopt our previous estimates of average

8 (or 27) HARVEST-YEARS, 1852-3 to 1879-80 inclusive.

at available for Consumption rage 'Gazette' Price).		Value of Wheat estimated to be Consumed † (At Average 'Gazette' Price).			Per Cent. of Total available.		Harvest-Years, September 1 to August 31.
From Imports.	Total.	Total.	Per Head.		From Home Produce.	From Imports.	
£	£	£	s.	d.			
13,156,542	36,414,472	39,095,914	28	5	63·9	36·1	1852–3
22,210,417	56,253,553	64,194,918	46	6	60·5	39·5	1853–4
10,452,929	68,018,475	62,029,742	44	8	84·6	15·4	1854–5
12,066,896	59,285,971	65,847,949	47	2	79·6	20·4	1855–6
12,354,888	51,431,444	53,871,810	38	4	76·0	24·0	1856–7
13,813,054	52,289,385	43,032,661	30	5	73·6	26·4	1857–8
9,946,546	43,019,404	39,701,015	27	10	76·9	23·1	1858–9
10,895,651	39,856,688	44,163,821	30	9	72·7	27·3	1859–60
27,691,212	55,194,695	54,904,599	38	0	49·8	50·2	1860–1
26,464,248	58,965,405	58,241,050	40	0	55·1	44·9	1861–2
21,938,788	52,641,052	48,061,204	32	9	58·3	41·7	1862–3
14,332,104	48,939,808	41,589,568	28	2	70·7	29·3	1863–4
11,024,330	41,447,145	40,923,723	27	7	73·4	26·6	1864–5
17,002,785	47,112,244	47,772,077	32	0	63·9	36·1	1865–6
23,026,316	54,576,562	62,399,183	41	6	57 8	42·2	1866–7
30,803,105	60,001,563	71,171,217	47	0	48·7	51·3	1867–8
20,608,473	59,673,623	53,420,445	35	0	65·5	34·5	1868–9
23,083,343	51,478,625	49,703,276	32	4	55·2	44·8	1869–70
23,944,619	59,396,413	59,337,815	37	11	59·7	40·3	1870–1
26,358,214	55,732,017	62,876,489	39	7	52·7	47·3	1871–2
35,235,527	65,159,883	64,294,876	40	2	45·9	54·1	1872–3
35,474,913	63,926,588	69,282,791	42	10	44·5	55·5	1873–4
26,169,770	54,921,751	50,914,742	31	3	52·4	47·6	1874–5
32,023,761	52,762,024	52,993,190	32	2	39·3	60·7	1875–6
33,181,225	57,353,495	64.237,747	38	7	42·1	57·9	1876–7
36,882,585	62,398,562	60,558,088	35	11	40·9	59·1	1877–8
30,006,473	54,329,962	50,021,041	29	4	44·8	55·2	1878–9
38,191,805)	(49,822,785)	(56,069,649)	(32	6)	(23·3)	(76·7)	1879–80
13,112,115	50,821,174	51,492,229	36	9	73·5	26·5	Av. 8 Years, 1852–'59.
21,535,424	52,359,872	53,132,828	35	11	59·7	40·3	Av. 8 Years, 1860–'67.
27,862,328	57,881,366	57,852,953	36	5	51·9	48·1	Av. 8 Years, 1868–'75.
33,356,761	58,027,340	58,272,292	34	7	42·6	57·4	Av. 3 Years, 1876–'78.
22,227,749	54,169,678	54,616,332	36	2	59·6	40·4	Av. 27 Years, 1852–'78.

ird eight, and 5·65 the next three years.

[*To face Page* 352.

produce per acre each year without change. We also adopt our previous estimates of consumption per head for the first two periods of eight years each without change. But, for the third period of eight years we assume the consumption to have been at the rate of 5·6 bushels per head, and for the last three years at the rate of 5·65 bushels, instead of 5·5 bushels over those eleven years, as previously reckoned.

Accordingly, until further experience should indicate further change to be necessary, we propose to adopt 5⅔ bushels as the average consumption per head of the population per annum, over the United Kingdom.

Table IV. p. 350, shows the estimated aggregate consumption of wheat in each year, and the amount of it derived from home and foreign sources respectively; and Table V., which follows (facing p. 352), brings to one view the particulars of the estimated home produce, of the imports, of the consumption per head, of the average 'Gazette' price per quarter, and of the cost of wheat (at the average 'Gazette' price), in the United Kingdom, in each of the 28 (or 27) harvest-years, from 1852–3 up to the present time.

Referring to the upper portion of the table for all details, and to the text for further information respecting some of them, the general tendency of the changes which have taken place within the period of our review is clearly indicated in the average results over the periods of 8, 8, 8, 3, and 27 years, given at the foot of the table.

According to the figures, the area under wheat was about 20 per cent. less over the last 3, than over the first 8 years, of the 27.

The average produce per acre over the United Kingdom was considerably less over the last two than over the first two periods. It amounted to only 27⅝ bushels over the whole 27 years, as compared with 28¼ bushels, which we had previously assumed to represent the average produce per acre of the country at large.

Owing to the reduced produce per acre in recent years, the aggregate home produce has reduced in a somewhat greater degree than has the area under the crop.

The annual imports averaged about three times as much over the last 3, as over the first 8, of the 27 years.

The total consumption of wheat per annum has increased from an average of about 18 million quarters over the first 8 years, to nearly 24 million quarters over the last 3 years.

According to the figures, the average consumption per head per annum was only about 5·1 bushels over the first 8 years, but it amounted to 5·67 bushels over the last 3 years.

The price of wheat per quarter has declined from an average of 57*s.* 8*d.* over the first 8 years (including the period of the Crimean War) to 49*s.* over the last 3 years.

The annual value of the home produce available for consumption has declined from an average of nearly 38,000,000*l.* over the first 8 years, to less than 25,000,000*l.* over the last 3 years.

The annual value of the imported wheat has increased from an average of little more than 13,000,000*l.* over the first 8 years, to more than 33,000,000*l.* over the last 3 years.

The annual value of the total wheat estimated to be consumed has ranged from under 40,000,000*l.* to more than 71,000,000*l.*; and it has increased from an average of about 51,500,000*l.* over the first 8 years, to more than 58,000,000*l.* over the last 3 years.

The average annual cost of wheat per head has somewhat reduced in the later periods; and it has been 36*s.* 2*d.* over the 27 years.

Over the whole period of 27 years, 40·4 per cent. of the wheat consumed has been derived from imports; and the amount supplied from foreign sources has increased from an average of 26·5 per cent. of the total over the first 8 years, to 57·4 per cent. of the total consumed over the last three years, of the 27.

XXI.—*Utilisation of Waste Substances and Economical Management of Materials, Machines, and Appliances on the Farm.* By Robert Scott Burn, Consulting Farm Architect and Engineer.

Characteristics of the Subject.—A glance at the title of this paper will show the comprehensive character of the general subject with which it proposes to deal. That, however, embraces a much wider range of topics than even the title foreshadows, as it is proper to observe that this paper was drawn up more with the view to make it suggestive, than that its tenor should be rigidly precise and definite.

In point of fact it is difficult, if indeed it be not here impossible, to limit the topics which the subject embraces. For that defined, as it may with rigid accuracy be so defined, as the "science of economy," takes within its range almost everything material. To those who at first sight may object to this important status here claimed for it, perhaps the following, by an able authority, may be suggestive as bearing thereon. Referring to the operations of practical chemistry, in the various classes of technical work in which the principles of that science are embraced, and there are but few which can be excluded from this category, the following is by my authority set down as axiomatic: "Those experiments, or that work only, is perfect when *no useless refuse* is left as the resultant of the process." From this is deduced, as a corollary or natural consequence, "All progress" in any of the branches of technical or material work "will resolve itself into the progress of *economy*."

But refraining from insisting upon this high status for my subject, and taking a very much lower one, even then it will be admitted readily enough that it possesses no small claim to the consideration of all interested in the material progress of the arts and sciences. And, with reference specially to that science in which the readers of this Journal are so deeply interested, it is not easy to limit its utility, or to narrow the range of its application. Nor assuredly can there be a time better fitted for the application of its principles to the every-day practice of the estate or the farm than the present. Never before were these more likely to meet with ready acceptance and intelligent reception than now—now, when agriculture is so depressed that every legitimate means, however humble, ought to be taken to lighten the load which the great majority of its followers are called upon to bear.

In proposing to carry out any new plan by which work is to be done more rapidly or economically, that plan has all the better chance of being readily adopted, should it demand few appliances or aids, more especially if those would otherwise have been of an expensive character. Now this is one of the great advantages possessed by the plans or methods of operation or procedure by which the numerous details of my subject are carried out. Practical as those details are, they can be secured at once without the employment of appliances more or less costly, and always difficult, certainly not easy at all times, to be had.

The very nature indeed of the various classes of the general subject, or rather the terms in which they are stated, indicate that all unnecessary outlay is to be avoided. The doing away with "waste" of every kind, whether that be of time or materials—the transforming into substances more or less valuable those which are already "waste," or considered to be such—the employment of substances already valuable, but in such a way, or in such ways, as to increase that value—the distribution of substances of various kinds in daily use on the estate or the farm, in such a way that a lesser bulk or weight will give higher economical results—the pointing out of new sources of power, and of materials useful in a variety of ways—such sources being present on the estate or on the farm—the discussion of subjects such as these, and the description of their details, point obviously in one direction, namely, that in the very attainment of the economy, expenditure is to be avoided as much as possible. The position may be illustrated and enforced by putting it, *au contraire*, somewhat absurdly thus—that to carry out a system of economy it is necessary to employ expensive appliances, and to adopt wasteful methods of working. As to which, nothing surely needs further to be said.

Synopsis of subjects proposed to be treated of.—Where so many subjects lie before one for discussion and illustration, it is, I confess, somewhat difficult to decide upon those to be taken up first. And this more especially when all, or nearly all, are full of practically interesting details. But, upon due consideration, I take two great divisions under which the classes of subjects will fall for discussion. Of these divisions the first is the *economical use and management of materials valuable in themselves.* Of the various classes by which this important division can be illustrated, I select in the first instance the following.

(1.) *The economical use and management of fuel, and of steam-engine-furnaces, boilers, and general mechanism.*

The second division of the general subject concerns itself with the *collecting, storing, and utilisation of substances known as, or considered to be, "waste" or useless.* This other important division I propose to illustrate by the two following classes:

(2.) *The collecting, storing, and utilising the "Waste" materials, which on all or nearly all estates and farms are allowed to lie littering about the yards, buildings, roads, &c.*; and

(3.) *The collecting and storing of water obtained from neglected and generally unknown sources on the estate and farm.*

These three subjects, as illustrated in the following paragraphs, are placed under this disadvantage, that from the very nature of this paper, as explained in the first paragraph, they are unfinished. They are but sketches, so to say, the finished and detached designs being the work which may or may not be taken in hand at some future and more favourable time. Nevertheless, in the present form of simply suggestive sketches it is hoped that much of a practically valuable character will be given; and in such a way that sundry cognate points of some importance, not always carefully considered, will be suggested to the reader.

It may be objected to some of the details of nearly every system that they are comparatively trifling, and that all are too minute to pay for the time and trouble which attending to them involves. But the same objection may be taken to almost every kind of work, forgetful of the fact that the little things are essential to make up in point of fact the larger details. It is but a truism to state this, yet the lesson it teaches is too apt to be overlooked. And it could very easily be proved that in very many classes of every-day work the complaints everywhere heard of work badly done, sometimes not done at all, though charged and paid for, arise from the neglect of minute details. And it may be very fairly presumed that the known mistakes of many workmen spring from the contempt, openly expressed, for what they call trifles. And the converse of this might as fairly be expected if our workmen were educated up in the great point in believing in the value of little things. Such practical experience as I have had with men and of work leads me to hold a very strong opinion on this point. This, at all events, may be premised,—that the attention to minute details will bring about results not altogether trifling in a paying point of view, and this is the point from which nowadays we have come to look at all things. Scientific industry is now, at all events, clearly on the side of the economy of attending to little things.

(1.) THE ECONOMICAL WORKING OF STEAM BOILER-FURNACES, AND OF STEAM-ENGINES.

In discussing what may be called the ethics of economy, the workman is not seldom blamed severely for being indifferent as to waste, whether that be of the time or the materials of his master. At the same time it is worthy of some consideration that in some departments he may not know in what or how to save. And one of the practical outcomings of this position will be found at the very threshold of this important department of Estate and Farm Economies in considering the

Ordinary position of Engine-drivers in the Farm on first undertaking the duty.—A young or middle-aged man, as the case may be, has the farm engine "told off" to him as his duty, or as forming part of it, in cases where it is not constantly or, say, often working. All that he is asked to do is to "fire up." And perhaps by means of lots of coals, shovelled on any way, and the abundant use of the fire-irons, one or even two practical lessons, so called, may be given him, and possibly also a rough lesson as to what the steam-engine is, what works it, and how, with the materials at his command, he is to keep up this source of working power. This will probably be all in the way of education to his work which he will get even under what may be considered the most generally favourable circumstances. And these lessons will generally end, if indeed they do not begin, with the simple decisive dictum, "fire up." But in what "firing up" consists of properly, whether it is a thing which may be done "anyhow," or which is the right way or the wrong way to do the work in, the poor stoker too often is at a loss utterly to determine. Left to himself, then, he goes blundering on, wasting coals in abundance, for which no proper return or working value is obtained. Happy is his experience should he only stop at this side of waste, and avoid some fearful accident, which may imperil his own life and that of others, and waste much valuable property.

Accidents arising from careless working of Steam-engine-Furnaces and Boilers.—Nor need one wonder at the frequency with which accidents of this kind occur, nor at the intensity of the suffering and the greatness of the loss which they sometimes entail. One has but to give a moment's intelligent glance at a steam-engine with its boiler to see what powerful elements of destruction and disorganisation they contain within themselves;—elements which may be brought into existence and let loose at any unexpected moment to work their wild will, through no wilful neglect, but through sheer ignorance of the forces thus put into too often incompetent hands.

Competency of ordinary Farm-labourers to be quickly taught to take charge of Steam-engines, and to work them economically and safely.—And yet, with all its power, nothing is so easy of control as a steam-engine; and it is quite competent for ordinary farm-managers to impart such an amount of knowledge to even an uneducated labourer as will enable him to manage a steam-engine and its boiler not only safely but economically. The most careful stoker and best engine-driver I have ever known had been but a farm day-labourer.

With all our improvements in steam machinery, there is yet a vast deal to do in the way of working it economically. It may be sent out by the maker in perfect order, and calculated to give the maximum of power with the minimum of fuel-consumption. But all the circumstances of working are changed from the period when the "maker's man in charge" leaves his charge to the ordinary routine of farm-labour.

Then the engine-driver or stoker finds his difficulties begin; and it will be well for him, well also for the future character of the work to be done, if at this stage the young or inexperienced engine-driver has some one to give him now and then a look after, now and then a word of encouragement, which goes often very far in inciting a man to do his duty well. Not always, however, I regret to have to remark, will it act powerfully for good. Next to this, or rather superior to it in efficacy, is trusting him, letting him know that he is trusted. This, of course, implies a previous teaching as to what his duties are, and in which and for what he is to be trusted.

Value of good Stoking, what it ensures in economical and safe Steam-engine driving or working.—When a celebrated practical engineer, on being asked a round of questions as to what constituted good engine-driving, gave to them all the same answer, "good stoking," he was not far wrong—from many points of view absolutely correct. And although in some senses paradoxical, like all sayings of the class, it conveyed a fairly correct answer to them all. Assuredly, good stoking ensures economical consumption of fuel, the maximum of steam produced at the minimum of cost. It ensures the regular steady supply of steam sufficient for the requirements of the steam-engine. It ensures the engine being worked at the speed best calculated for the work to be done, never "racing" or running away through an excess of steam, or making every stroke with difficulty through lack of it. It therefore places within command the means of working the engine at a steady uniform rate; this tends to keep the various parts in better repair, and that for a longer time than would be the case with irregular or over-driving. Good stoking may therefore be said to be something more than what it is popularly conceived to be. It is at all times worth aiming at, especially at times like the present, when it offers, should it offer nothing else, a saving of fuel. How it can be carried out in practice I shall endeavour in the next few paragraphs to explain; having, in what I give in these, chiefly in view the class to which the care of farm steam-engines is usually given.

The quality or heating value, and the mechanical condition, of kinds of Coal:—two elements in good Stoking.—Some conceive that good stoking wholly depends upon the quality of coal; the higher that happens to be, the better the stoking. While the quality of the coal is, no doubt, an important factor in the calculation, it is by far from being the most important, or the only important one, as some claim it to be; for a good efficient stoker will raise better steam, and keep it more uniformly up to the required pressure, with inferior coal than will a poor stoker supplied with coal of the best or of much better quality. In point of fact, the best quality of coal is not the most economical; it is apt to "fly off" too quickly. Considered merely by itself, the best quality of coal is of course the best for steam-raising purposes. But there are circumstances which modify this value. The best quality of coal is not, as a rule, used for steam-engine purposes; and where exceptionally high results are obtained in the efficiency of one steam-engine as compared with another, it may be worth while to inquire what the quality of the fuel employed is. It will in such cases be often found that the so-called most efficient engine has been driven by coals of a quality and in quantity greatly superior to those used in the contrasted engine. Before results can be fairly compared, circumstances must be equal. Now, seeing that an essential element in good stoking is uniformity in firing, it is obvious that a great help to ensure this will be the uniform quality of the fuel itself. So that of the two it may be almost affirmed that it will be better to have the coal of uniform mechanical character, even if it be inferior in quality, than of varying character, though it be superior in quality. In practice, when the coal is of an uneven quality—lumpy and small together—a good careful stoker will almost invariably be found to sort the coals before using them. Hence in our largest factories, where machine firing is not adopted, the quality, or rather the kind, of coals used has a close reference to the mechanical uniformity of the mass. Thus the class of coal known generally throughout the North of England as "nuts" is preferred by good stokers; so much so, that the term nuts is often taken to be synonymous with "machine or engine coal." This coal, as the name indicates, is made up of screened coal, so that the pieces are pretty uniformly of the same size—from small to largish "nuts." There is amongst this class a good deal of "slack" or small, which is very useful in banking-up," and also in "bridging, or backing up." Some first-class stokers indeed prefer this "slack" or "small" of coal, as it enables them to secure most efficiently the "uniform firing" they know to be so essential to success.

Importance of uniform and regular Firing. Influence of the form of Boiler and Furnace upon this.—This "uniform firing" precluding, as it does, all "forcing in firing," the stoker is in this respect greatly dependent upon the boiler and its furnace which he has to work. In the Cornish pumping-engines, where the most economical consumption of fuel in proportion to the steam raised is perhaps to be met with, there is not only abundant steam and water space in the boiler, but ample furnace-bar and heating space in the furnace. Under these circumstances there is not the slightest excuse, as there is no necessity, for forcing the fire; and indeed with this high class of steam-engine and boiler such a thing is never tolerated. But in the case of the class of portable steam-engines and boilers now so largely used on farms, a large bulk, and by consequence that of the fire-spaces in furnace and boiler, cannot for obvious reasons be secured as in the case of stationary engines and boilers. Hence the greatest argument which can be brought forward in favour of stationary as against portable steam-engines and boilers is just this: that in the stationary class better proportioned steam, water, and fire-spaces can be secured, and that these lead to steady uniform firing, obviating the necessity of forced or over-firing, and generally secure economical consumption and working throughout. No doubt in the portable engines most recently sent out the dimensions of the various spaces are so well proportioned that an extraordinary degree of "efficiency" is secured in the boiler-working. Still, there are throughout the country in daily use an enormous number of engines of this class which have been so long in use that they may be said to have outlived the period of improvement; and with this, or at least with many of this class, the poor stoker is almost compelled to be continually "forcing his fire." And any one at all acquainted with what furnaces are and what stoking is, no sooner opens the furnace door than he sees that forced firing is unavoidable under such circumstances of confined heating and water spaces. Indeed, one does not always require to look into the furnace; it is often enough for the expert to look at the boiler barrel, and to compare it with the power or dimensions of the engine.

Portable and Fixed or Stationary Steam-engines and Boilers.—Although by many overlooked in considering the elements which affect the question of economical driving of engines, it is worthy of note that much of this is frequently dependent upon the kind or class of engine and boiler employed. Practical engineers know the points of distinction between fixed or stationary and the usual class of portable engines and boilers. These points are by many quite overlooked when the question of the kind of engine to be put down is being considered. This is scarcely to be wondered at, when we remember that the question—so long a vexed one in agricultural mechanics—of stationary and portable steam-engines has long been looked upon as settled, and that by a verdict wholly in favour of the portable—the stationary nowhere. But there is in this perhaps another instance how circumstances generally bring about, or tend to bring about, a reversal of the original decision. It is not here affirmed that this reversal is at all complete. Far from that. But stationary engines have not only held their own, maintaining the position they occupied when the controversy was decided, but they have of late years greatly increased in numbers. At all events this is more abundantly evident that circumstances are very materially altered in favour of the use of stationary or fixed engines, as compared with the period of settlement above alluded to. A vast deal more work is concentrated at the farmery or farm building requiring power to do it than was contemplated at the period I have referred to. Then everything apparently pointed to the fact that the work of the steam-engine lay outside and beyond the range, if not near to the buildings. It is not necessary to point out the changes, not only in the work hitherto done in a certain way, but also the new direction in which work has to be done, which has led to this concentration at the buildings of work requiring "power" to do it with. But it is so, and it is likely to be on the increase, especially in the case of large farms and of estates. It is therefore, with many, open at least to doubt the wisdom of employing portable engines for such a class or for such classes of work; and this in view of the much higher mechanical effect, or, to put it in popular phrase, the more economical work got out of stationary than out of portable engines worked under the ordinary routine of farm labour.

Some may be inclined to join issue with me here, and to dispute this. But the present is not the place to discuss the merits of a question long ago, in point of fact, decided. It is sufficient for the purposes of this paper to rest satisfied that I am in the main putting this point correctly in the terms which I have employed, to which only I may add that, to those who are intimately acquainted with the essentials of accurate machine working, ocular proof of the correctness of my statement may be obtained in cases where there is a fixed or stationary engine and a portable engine working side by side. In this conjunction, not difficult to be met with, the actual mechanical conditions of the two classes of engines—each being in its own class of the same rank or quality—can be *seen*. And I leave it to any skilled mechanic to say which of the two engines comes in its working the nearest to the perfect supply of all the mechanical necessities of the case. It is not of course contended that stationary engines are better than portable ones for all classes of work. Such a position, in the actual circumstances of general farm and estate work, would simply be absurd. All that is here affirmed is that, under circumstances greatly on the increase, especially on large farms and almost always on large estates where there is a sufficiency of regular work done at a fixed point—the workshop of the buildings—and by the aid of fixed machinery capable of steady and uniform working at whatever speed driven, to employ a steam-engine regularly and constantly, it will tend to higher economy in working to put down a fixed engine and boiler. When the work at the buildings is fluctuating and irregular, and a portable engine in any case is employed on the farm, for which, again, there is only irregular work, it will then of course be the cheapest way to use the portable engine in the workshop as it is required.

Much could be said here under this head, did space permit, from which some practical hints as to the economical use and careful treatment and management of farm-machinery *in general* might be obtained.

Mechanical advantages of Stationary or fixed Steam-engine-boilers.—The great advantage obtained by the use of a fixed or stationary boiler and furnace is, that there being so much the larger dimensions to work with, there is little chance of the heating-surfaces and boiler water-spaces being so confined, as must of necessity be the case even in the best of our portable engines. This is obvious enough on very slight consideration of the circumstances. For in a portable engine the reduction of weight and the securing of compactness in the whole are points of considerable importance. But, however well proportioned the heating-spaces of the most recently made portable engines are, there is a very large class in almost daily use in which the proportions are anything but well designed. Those engines, as we have said, are chiefly old, at least, if only comparatively so, they have been made prior to the introduction of the most recent improvements in this class of engine.

In one sense, therefore, it is true that the stoker, with the care of a boiler-furnace of this last class, can scarcely help himself, but must force his firing. Still, for the evils and the consequent losses both of time and coal, there is fortunately a source of mitigation and relief. This lies in the system, more or less modified according to circumstances, of uniform steady firing. This, for reasons which I have already briefly explained, is best carried out in the usually well-proportioned furnace of a stationary or fixed steam-engine-boiler. My further remarks, therefore, on the important subject now under discussion will be formed on the supposition that the fireman or stoker has a boiler-furnace of this description to manage. And in order to render what I have to give as free from technical difficulties as possible, I shall briefly describe the mechanical and constructive arrangements of a boiler-furnace. This, of course, is not meant for, as it is not required by, professional readers, or for those who are *au fait* to the subject, but it may be useful to many readers, and may serve as the basis of brief instruction to those who may be disposed to impart some knowledge of the kind to those in their employment. Before, however, giving this, let me glance briefly at what constitutes bad stoking.

What bad or careless Stoking practically is.—Of the two terms I have more than once used, "regular" and "irregular" firing, the first obviously excludes all firing by what is graphically called "fits and starts." This is ever the style of firing adopted by inexperienced stokers. They throw on shovelful after shovelful of coals, generally with a total disregard of all uniformity of size and disposition. The coals thus thrown on lie pretty well up to the front, sometimes even well on to the "dead" or "dumb" plate, near the furnace-door; and they are allowed to lie there to burn as best they can, throwing out the while huge volumes of dense black smoke at the chimney-head. After an interval, longer or shorter, as it may happen to be, for everything in this system is done by "fits and starts," the fire-iron is snatched up, the furnace-doors thrown open, and the heap of coals, half-consumed, as the case may be, stirred violently up, one part shoved forward farther on to the furnace-bars, smoke being more or less abundantly thrown off as the amount of unconsumed coal is greater or less. With this irregularity in the time of firing, want of uniformity *in* the firing is almost certain to be the result. It is, indeed, almost in vain to expect that the coals will be uniformly distributed over the surface of the fire-grate with such a system as that just described; nor is it possible under it to prevent a very large proportion of the heating or available working constituents of the coal passing off by the chimney as unconsumed gas or fuel. This condition of the furnace may be likened to a gas retort, which is only heated in order to pass off the gaseous vapours uselessly into the flues, in place of conveying it to the regular apparatus, by which the crude gases or *smoke*, as they are popularly called, are converted into a transparent or colourless gas. Now, although a steam-engine boiler-furnace is not practically, in the ordinary sense of the term, a gas-making apparatus, still in one sense it may really be so called, inasmuch as it is possible to be and is often actually such.

To fire or stoke the Furnace, so as to prevent the formation of volumes of black smoke, and thus to secure the economical combustion of the Fuel and its Gases.—There is perhaps no more crucial or trying test by which to judge of the efficiency or otherwise of the stoking of a boiler-furnace than to watch the "behaviour," as engineers would say, of the chimney-flue. If this sends forth occasional volumes of densely black smoke, which continue for some time and then die away, to be succeeded after a "clear interval" by fresh volumes, then it may be safely predicted that the stoking is bad, fitful, or irregular, anything but uniform, and therefore wasteful. And without going close to the boiler for actual inspection, an expert can tell by simply watching the chimney for a time, the exact times of the firing-up, stoking, &c., gone through by the stoker. Now all this, and the consequent great waste, can be prevented by good stoking; and this is within reach of any man of average intelligence. Every shovelful of coal thrown into the furnace contains so much carbonaceous matter within such a volume of combustible gases. It rests mainly, I may say wholly, with the stoker whether this shall pass off into the atmosphere through the chimney in the form of black smoke, more or less dense, or whether, as the gases (or smoke) are produced, they are flashed into flame and intensely heated gases. In the former case a certain volume of cold vapour—for it *is* this—containing a large bulk of unconsumed yet developed black combustible matter, is passed along the boiler-bottom and along the flues, giving out but comparatively little heat. In the latter case, where the smoke is consumed—to use a popular phrase—gases are formed, which, passing along the flues in a highly heated condition, give out much heat to the boiler and its contents. This advantage, and more than *this*, can be secured by attending to the stoking, and doing it well and carefully.

THE COLLECTING, STORING-UP, AND THE UTILISATION OF THE "WASTE," OR SO-CALLED WASTE MATERIALS LYING ABOUT THE FARM BUILDINGS, AND THE VACANT SPACES, ROADS, ETC., IN THEIR VICINITY.

Many persons who were in the habit of travelling much by railway twenty or thirty years ago—must have been struck with one thing. This was, say in a long line of railway, the great number of "heaps" of waste material, chiefly metal near the stations, and those at various parts along the line, were made up largely of contractors' plant. For years all this material lay untouched and apparently forgotten by the officials of the line. At last, under a new regime, those heaps were cleared off and sold—or otherwise disposed of. They, in the aggregate, represented a very considerable amount, and their disposal further left clear very extensive plots of land which, when utilised, added considerably to the sums gained by the plan of getting rid of all this "waste" or "useless" material.

The lesson taught by this example is obvious enough. It certainly is worthy of being followed, and this, not merely because it will afford an example of carefulness to the working men of the farm which I believe to be essential, but it will secure that degree of "order" which I deem little less so. There is this further incentive for the example to be followed, that the material collected will be quite equal to the cost of the collection. This will be so in the worst, or rather the poorest of cases; but in some, indeed not a few, it will, I doubt not, be matter of some surprise that so much valuable material has been allowed to lie wasting away so long unobserved, at least uncared for. In nine cases out of ten the truth really is that few have any conception of what the material is which they see littering about their buildings, &c.; and it is not of course possible that they should be able even to guess at its value till after the collection.

Such material is not all "worthless rubbish," as is often stated, but much of it is valuable for many useful purposes on the Estate or Farm—even the veritable rubbish is capable of being utilised.—And it is at this stage that a mistake may possibly be made, as to which a word of caution may be useful. Looking at the collected materials, one is exceedingly apt to pronounce the whole as simply a "heap of rubbish," and to doom it accordingly to summary destruction. Some surprise may be expressed the while, how so much of this "kind of stuff" could have been collected and kept up year after year. A closer investigation and a little more thought will, however, show that amidst much that *is* veritable rubbish there is also much that is more or less valuable, and worth putting carefully aside for practical use. I have known materials required in certain constructions to be sent for in the nearest town, and of course paid for at the market-price, when the same materials, almost if not practically quite as good, have been lying littering about the farms in some place or another. After having collected what is called the "rubbish about the place"—found here, there, and everywhere, as on many an ill-regulated, disorderly-kept farm, will be the case—let it be, by one of the most careful men, looked quietly over. The best of the "rubbish," of whatever kind, as bricks, timber, slates, &c., should be carted out and laid aside, each in its respective place. If the "accumulating period" of "rubbish deposits" has extended over several years, and more especially if during it some "building work," as it is generally termed, has been going on, the aggregage of material will be very considerable in amount. And assuredly in not a few instances will the proprietor or tenant be surprised to see how much of it may be used in one odd job or another. It is not, of course, here maintained that on every farm the materials exist for such a varied collection as hinted at above. But in nearly all, where "order" has been neglected for long, and things allowed to lie as they gather or get accumulated, when order is at last established, a much larger, more varied, and much more generally useful collection of material will be obtained than will by the great majority be thought it all likely to exist. Of course, the larger the place the more varied and extensive will be the work done on it, and, by consequence, the greater will be the accumulation of materials. "Order" being once established, the hitherto careless farmer will find it to be a good thing; better still if "order" be thereafter rigidly maintained, and the materials, as they are left on the ground, taken at once to the place where they are kept, so as to be ready to hand when wanted.

Building materials, or materials useful in Building repairs, &c., a frequent feature in the "rubbish deposits" of Estates and Farms.—I have alluded to the fact that a prolific source of "waste" material arises from building work having been carried on at one time or at several times during the "accumulating period of rubbish deposits." Those who know the building trades well, know the "weakness," some will call it the amiable weakness, of some of their members for leaving not only a goodly supply, in a few instances, of the materials which they use in their work, but also more than one of the appliances by which that work is done. Should repairing or other work, therefore, be pretty frequently carried on during the accumulating period, the "stock" of this kind which will be "acquired" by the owners or occupiers will be considerable; but it will be, so far as they are concerned, most innocently "acquired"; the truth being that they will know nothing about its being left till "order" is established and the rubbish collected, and the existence of this "found material" made known. Even then, in fact, many will be driven to guess and to wonder how "came such things there?" What I have said will be to them a clue to the seeming mystery or difficulty. But not the least advantage of "setting" and "*keeping* one's house in order" is that there will be no inducement to throw materials aside, no matter of what kind, anywhere or in any fashion; but, on the contrary, every inducement to save what is worth saving, or likely to be at one time or another useful.

A store or shed in which to keep materials of various kinds, &c., useful in various classes of work on the Estate or Farm.—This will soon be required, and will serve as a place in which to keep the most valuable materials of the "waste" heap, and from which to distribute them as required for work being gone on with. This store for working or constructive materials will be most usefully placed in connection with the implement shed and the workshop. And by way of keeping down the expenses of this department, the store may itself be a "shed," protection from the weather being what is only or chiefly necessary for the general run of constructive materials. For the smaller and more valuable articles, as tools, nails, bolts, &c., there should be a small lock-up closet, or a portion of the workshop may be set aside for this.

Carrying out the principle of "order" in everything, and in every department, all the materials should be so laid up in the "store" and "lock-up closet" that a hand can be put upon any one article at once. This may appear to be "finical" and "pottering" in the extreme. Practical men will not think so, for they know that the work of so arranging materials is only or mainly required at the beginning, and that once the system is established it involves the outlay of but little time to maintain it efficiently. They know, further, that even if all this were otherwise, and much time required to arrange the materials orderly, time would still be saved in the long run. It is difficult indeed to over-estimate the importance in cases of emergency of being able *at once* to find some material, tool, or appliance—and emergencies of a kind involving the chances of loss of life, and generally of property, are likely to arise, and do often arise, in the daily routine of farm-work. At all events, such arrangements as now indicated will *economise time*. This no one will dispute, any more than it will be disputed that to save time is to save money. And saving of any and every kind is what the farmer and his staff should aim at. And how to save and what to save are the subjects of this paper, even its very *raison d'être*. And although, taking the departments separately, the value of what is saved may be but trifling, still, when all the departments are taken together, an aggregate amount will be arrived at by no means to be despised. Over and above which, the other advantages I have named as flowing out of the improved system of working should by right be placed to its credit; not the least valuable of which is the establishing of a system which will maintain order throughout the farm.

I have named a few of the odds and ends of materials which are to be found in greater or less profusion on many farms. Those will not always all be found, but there is one material rarely absent, and that is wood or timber. This may either be almost wholly the home-grown timber of the estate, or it may be partly this, and partly such pieces or scantlings of foreign timber as may have been left over from the time when the farm-buildings were at first erected, or from some subsequently made repairs, alterations, or additions. But, however found, it may be perfectly set down as a rule having few exceptions that both in quantity and quality the waste timber "lying knocking about,"—as the popular phrase somewhat paradoxically has it—is much more worthy of attention than is generally supposed.

Saving and utilising the waste timber of our Estates and Farms.—In too many cases no attempt is made even to save or set aside the so-called "waste timber" lying at numerous places. So far from utilising any of it, I have, as already named, known of instances where timber was required for repairs, where it had to be sent for, and of course paid for at the usual market-price, although all the while more than one piece of the waste timber was suitable for the purpose. There is of course a considerable proportion of this waste timber wholly unfitted for use in construction. But there need be no waste actually perpetrated for all that. If for nothing else, even the very worst of it will be useful for firewood. And not merely in the farm-buildings, where steam-engines are employed, and cooking for live-stock carried on, is there a large demand for this, but also in the farm-houses and cottages. Yet again in this department have I known of instances where firewood—for the house, however, chiefly, if not wholly—has actually been bought at and carted from the neighbouring town or village. And this where cartloads of it literally lay rotting and wasting away in the very vicinity; and of course adding to the general untidiness of the farm-buildings! On the other hand, I have known large stores of excellent *firewood* obtained by the trifling labour of some of the younger servant girls, who, when taking their little strolls about the place, carried with them baskets which almost invariably they got filled, and that, moreover, when one could not easily or readily see materials lying littering about. Indeed, I have known also some of the " wee toddlin' things " of the household help one to some purpose in this little industry, so fond were they all of "sticking," as it was called. But, failing this source of supply, a trifle by way of extra-wage given to the engine-driver, or some other of the more intelligent of the men about the place, will always secure a goodly supply of this article so necessary in all households and, under the usual system of working, also on farm-buildings. It is only the labour which has to be paid for, the material is there; and however trifling may be the amount which represents the saving thus effected, still it will go to swell the aggregate. More than this, it will carry with it its lesson to those who might otherwise be wholly indifferent to saving of any kind. When a man finds that he actually adds a trifle, be it literally no more than this, to his weekly wages by using up what he has always looked upon as "out-and-out waste, worth no one's while to look at or after," he will be more apt to look at it in a very different way from that in which he at one time indulged.

The simplest way is of course to use it in repairs. This, however, is not always so easy in the case of home-grown timber. This is generally, we may say invariably, in the "round," as it is technically called, and, unlike the squared and dressed-up pieces of foreign timber, is not so readily adapted to the work on hand, which, speaking generally, is constructed of squared timber. A natty handy fellow can, however, soon get into the way of using round timber, and that, too, with the display of considerable taste when used in conjunction with squared timber. There are, moreover, many pieces of work which can be done wholly by the use of round timber. Some men have quite a clever knack of fixing upon the piece, both in size and shape—the latter especially—and to assign to it that precise position which gives not only the strongest but the neatest and most striking combination possible. Gates, fences, outbuildings of a simple kind, can all be made, if not in the best, certainly in by far the most picturesque way by the use of round timber. Even in general work, therefore, there is a wide field for the utilisation of the timber, including "round," which on so many farms is greatly neglected, and in not a few allowed to go utterly to waste.

The use of "waste," or what is considered worthless, timber in the construction of sundry buildings of the Farm.—Here the widest field exists for the exercise of skill in planning and construction. It is not by this meant that there is any real difficulty in carrying out plans by which waste timber can be made serviceable in the way above indicated. On the contrary, some of the methods open to use are so simple in detail, that even labourers wholly inexperienced in construction will within a very brief space be able to grasp and thoroughly understand what has to be done, and be able very quickly and efficiently to do it. What is meant by the skill in design is simply the ready choice of round timber calculated to make the neatest design. Some men, as above stated, have an extraordinary knack of putting together round timber to form almost any desired construction they may require, and this also of the strongest.

It may of course be said that there is nothing to be gained by using timber only or principally for any of the buildings of the farm. It is more perishable than the ordinary building materials, is more liable to be burned, and, taking everything into account, is not so very much cheaper, so as to offer any great inducement to use it. All this is very true, although circumstances will materially modify the conclusions here come to. Still the point I am aiming at is not to show—although in some points it could be shown—that timber-work in sundry buildings is cheaper or better than brick or stone; but that the timber being there, or being assumed to be there in abundance, and obtainable at the cheapest of rates, much being otherwise "waste," or allowed to become so, it will be the truest economy to use it. And beyond all doubt it can be so used that it will be almost fire-proof, and just in so far as it approaches this condition, so also it approaches the condition of being able to withstand "wear and tear." Used in conjunction with other materials by methods presently to be noticed, timber, or rather "composite" structures in which timber plays an important part will hold their own against those built with the ordinary building materials and in the ordinary way. That way, I need scarcely observe, does not always secure the best and most lasting work, especially if done by some contractors who, if not looked pretty sharply after by those who know what good sound work is and how it ought to be done, do not always give their employers the best work.

Of course on some farms the supply of "waste" timber—using the term "waste" in the sense I have all along in this paper employed it—will be comparatively small, and only available therefore as a rule for repairs, or for constructing small objects, as gates and the like. When the supply collected from various parts is considerable, as in some cases it will be, it may be made available for the construction of the less important structures, such as outlying stock-houses or shelter-sheds in pasture-fields and the like, or for one or other of the many kinds of small but useful buildings required from time to time on estates and farms, or which improved systems of working may demand. On estates where home-timber is grown to even but a small extent comparatively, there will be a source of supply of round timber useful in the construction of such-like buildings, &c., &c., a supply which, however, is too often made "waste" in the most wasteful of ways. Much of this apparently seems bound to be got rid of thus easily and quickly. I have not seldom been surprised at the reckless way in which the "loppings" or "thinnings" resulting from the cutting down of timber have thus been "put out of the way," as if they really were things which it was a duty—and too apparently a pleasureable one—to "get rid of." And yet for by far the largest proportion of such "loppings" or "thinnings" a use could have been easily found, not merely in the way above indicated, but in other ways, the direction of which it only required but a very little thoughtful consideration to discover or trace out. On this principle, that even the fragments or the waste of waste materials should be gathered up so that nothing be lost, very little of such sources of supply need or ought to be consigned ultimately to the doom of the utterly waste—consumption or burning. But when burning is to be done, why should *that* not be made to serve some useful purpose, in place of being wasted away in an open heap of burning materials of which the residue—useful as a manure—is not attempted to be saved even by cottagers in whose gardens it might be of some value. I have known not seldom the head gardener at the mansion driven to his wits' end to find a supply of stakes for various departments of garden-work, such as pea-stakes, when in some parts of the estate or the home farm a bonfire—so to call it—has been going on for days, consuming cartloads of wood highly useful to him. This, no doubt, is a very bad example of careless and reprehensible indifference to waste of the most wasteful kind. Yet it has been perpetrated before now, and may be perpetrated again. When done, no better evidence can be given of the want of care on the part of some one who has the control of a certain department, and of the utter lack of unity of purpose between the heads of the different departments, I may, indeed, say of the absence on the estate or farm of the principle of making the most of things and the avoidance of waste of all kinds—a principle which, known to be established in one department, is found soon to permeate through all the other departments, and by consequence leading, so to say, and influencing the action of all their "heads," so that they are sure to work in unison, having but one object in view, namely the interest of the estate. What then I have here classed as the waste timber of the estate can be largely increased in amount and value, if from no other, certainly in not a few instances from this source now noticed. And where those are not sufficient for the purpose of erecting what may be called comparatively large structures, the supply may be supplemented by such longer and larger pieces, as may be absent from the collected waste, from the stock of home-timber cut for sale or for use on the estate. For the majority of the structures required, no great supply of such extra timber will be necessary. This will be confined, as a rule, with few exceptions, to the vertical timbers or posts of the structure; the collective waste will generally provide a sufficiency of the smaller pieces required.

I have said that the best method of using waste timber in the erection of structures is the "composite." The main feature of this is the employment of non-combustible materials made into a species of concrete or hard-setting lime. Better still is the employment of a true concrete, faced with Portland cement as the binding or setting material. Properly set together, it is surprising, even by the employment of the least valuable of the two materials here named, how strong and durable a building can be obtained, and at a comparatively trifling cost; this more especially when the various materials, other than the timber, can be obtained on the estate or farm. I do not here wish it to be understood that I advocate the employment of timber in conjunction with other materials for the construction of buildings of the farm, save those of the simplest and most unpretentious character. These may be confined chiefly to odd or extra and outlying buildings, as shelter-sheds, &c. It could, however, be very easily shown, as already hinted at, hat even superior structures, such as cottages, could be erected n this plan, which not only in point of pleasing appearance, but in that of efficient and lasting construction, would hold their own against many of those brick-and-mortar erections which cannot be said to adorn some districts of the kingdom.

Waste substances of Farm Buildings and Roads; useful in the formation of Compost-heaps.—The utilisation for manurial purposes of the waste substances collected on the farm itself, and also obtainable from other sources, is a subject which is of importance enough to demand a special section by itself. This will be found to possess practical features more numerous and more important than many at the first blush of the matter would be disposed to admit. I here simply refer to the subject to show that, if kept in view, it will be another inducement to have the farm-buildings and, indeed, the farm throughout kept in the most orderly fashion. Those who know the value of "order," and the influence it exercises on the *morale* of those engaged in any work in which it is observed, have a difficulty to believe otherwise than that a disorderly farm cannot well be a carefully cultivated one. Taking even the most kindly and charitable view of the case, one will be compelled to believe that there will be loss somewhere; certainly there will be of time, and, in the case I have just referred to, there will be beyond doubt decided loss of material. For, even admitting that the materials which are allowed to litter about the buildings, roads, &c., of a disorderly farm are of no value in the way I have indicated in the preceding paragraph, it will scarcely be denied that much of them may be, and would be, found useful in a high degree in the formation of the compost-heap. I fear, however, that it must be said that but too many of our farmers are not fully alive to the *value of the compost-heap*, as in their own pecuniary interests I believe they ought to be. Nor if they are ready to admit its value as a manurial help, do they seem aware that they have at command so large a supply of materials for its composition as they in reality have. But they require looking for, in some cases "hunting up," to use a graphic phrase, although it may be taken as a rule that they lie ready enough to hand, but too ready in one sense, as they are but eyesores to those who have the love of order developed, if, indeed, they do not further appeal but too strongly to another of the senses, as suggestive of anything but the "balmy gales of Araby the blest." Worth looking for they are, and the trouble of collecting and storing them up will be abundantly repaid by the neat and trim look of the farm-buildings and their surroundings, even if no other benefit be obtainable. Nearly every kind of organic matter in a decaying condition, or which is capable of comparatively speedy decay, is useful for the formation of a compost-heap. Some substances are specially valuable; and if the farm be situated near a town or large village, if a sharp look-out be maintained, it is surprising how extensive will the list be of materials, some of them of the highest manurial value, which may be obtained from this source. But the farm itself and its dependencies are perpetual providers of manurial substances, and as many of these get "littering" about, a regular system of collecting must be maintained to prevent this, and convert the "waste" into a "useful" substance.

THE COLLECTING AND STORING OF WATER OBTAINED FROM NEGLECTED OR UNKNOWN SOURCES OF SUPPLY PRESENT ON THE ESTATE OR THE FARM.

This, the third of my selected subjects, is one which possesses peculiar interest, not merely on account of its purely economical features, but because some of these have their origin in causes the existence of which is not even suspected by the great majority of the people. The general subject is one of wide-spread interest, but it concerns rural districts specially, having for them an interest altogether peculiar.

Peculiarities connected with the water-supply of Rural districts.—The concentrated populations of cities and towns are sure in the long run to have their necessities in the matter of water-supply attended to; and this, however badly they are supplied with this necessary of life, and however long they may have waited for it. But in the thinly peopled rural districts, although the units of the population obviously require this necessary equally with the units of town populations, they cannot put forward that aggregate of demand which ultimately compels attention. In the case of isolated houses they have to do as best they can. And even in the villages, where there is a greater aggregate of potential voices, there are examples everywhere of the truth of the saying that what is "everybody's business is nobody's business," when that business is unfortunately not managed in a business-like way.

Neglect of sources of water-supply in Rural districts.—The truth of this latter statement is perhaps in no department of social economies more singularly exemplified than in that connected with the wise and prudent collection, the careful distribution and the economical use of water in rural districts. It is not that the sources which have been so long neglected are neglected still; it is not that unknown sources which might be reasonably conjectured to exist, are not attempted to be placed within the region of the known. But what is, perhaps, the feature which at once puzzles and pains the scientific philanthropist, is that even the known, the obvious sources of supply patent to every one are not taken advantage of to their fullest extent, nay, in many cases, not taken advantage of at all.

Causes of this neglect.—It is somewhat difficult to account for this apathetic indifference, as being so widely spread. One can understand how it might exist, and why it does exist, amongst a certain class; it is not so easy to understand why it should amongst classes so well educated as our landlords and farmers and the better or well-to-do classes in rural districts are. All the more puzzling when we consider how distinguished they are for enterprise and energy in other departments, some of those even not so important in their issues as this of water-supply is. Of its importance they need as a class no one to tell them. Examples enough, and painful withal, have they had of the suffering entailed both upon man and beast, and of the enormous losses in the aggregate brought upon them in consequence of a long-continued drought. I am inclined, however, to suspect that all this arises not so much from the apathetic indifference which no amount of suffering or loss will arouse to action, as from the influence of certain considerations which have greater weight with them than they care perhaps to acknowledge. The first is the very commonplace one—that is, commonplace from one point of view—that the climate of this country is on the average more of a rainy than a dry one; and that the droughts, consequently exceptional, show their worst effects not universally, but only or chiefly, as a rule, in certain districts. The second reason, not so commonplace, and for the holding of which much more excuse can be made than for the first, is that this indifference to water-supply is only apparent, not real; that the supply would be gladly received, nay, gladly looked after; but that a fear exists that the attainment would only be reached after a larger expenditure of money than even the actual getting of the supply would seem to justify.

It is not necessary to say anything here as to the first of these assumed causes for the existence of such apathy as we find to exist in rural districts on the subject of water-supply. Enough has been said in other places, and more will yet be said, to expose its fallacies, and show how dangerous it is to trust to its assumptions. It is simple folly to trust to exceptional causes, not acting in the circumstances in which we ourselves are placed. But the second reason carries with it matter of more reasonable import, and therefore deserves to be more fully noticed and explained. And the best way to meet its difficulties, and to show how groundless to a great extent is its assumptions, is simply to explain the various details of the different classes into which the subject divides itself. These will bring out facts upon which figures may be based, proving that to avail ourselves of neglected sources of supply, and even of well-known yet generally unused sources, is not the expensive operation it appears to many to be. Possibly in more than one instance I might hereafter be able to show that the supply may be got under circumstances which will bring about a double advantage, with a single class of expenditure.

Classification of sources of Water-supply.—I have not space to classify the different sources of water-supply, and the various qualities of the water obtained from them. Suffice it briefly to say that all potable waters—*i.e.* those fitted for the use of man and the domestic animals—come under one or other of three classes or divisions:—first, rain-water, shed directly from the heavens on various surfaces; second, rivulets, brooks, or open running supplies; and third, springs concealed, requiring to be tapped for use, or open and ready, are more or less easily to be availed of. Although the statement may be matter of surprise to some, it is nevertheless true that under all three classes, with their numerous sub-classes, are to be found instances of "neglected or overlooked sources of water-supply." And this, even in cases where one would think it is impossible to overlook them, or when under the pressure of most urgent want. So true is it, as Goethe has so well observed, that the eye only sees that which it brings with it the power to see. Hence it is true that the eye requires to be educated as well as the other faculties; hence also the truth of the statement that of all the habits valuable to the farmer, the habit of observation is the chief. And this will find, if not a very wide, at least a most practically useful field in connection with water-supply.

The two classes or kinds of Water.—Numerous as are the varieties of water obtainable from the three classes named, all come under one or other of two great divisions—hard and soft. It is beyond the scope of this paper to enter into any discussion of controverted points, or to give descriptions of the characteristics of waters differing from each other. Suffice it to say that of these two divisions, the opinion has hitherto been generally held that soft water is the more valuable of the two. There is no view, however, taken of any point but what there are some ready to dispute its accuracy, and this of soft water is no exception to this rule. Notwithstanding, however, the grave character of the charges—so to call them—brought against soft water, and the apparently irrefutable facts or evidence brought forward in support of them, I confess to resting content with this—that there has been, and is now, an almost universal con-·ⁿnsus of opinion in favour of it. For washing and cooking ›urposes it beyond all dispute stands pre-eminently the first, and if it be not generally esteemed by man for drinking, and this chiefly, if not wholly, when it lacks that "sharpness" which the aërated waters of springs possess, it is assuredly not only the favourite of, but the most healthy drink for, our domestic animals.

General glance at the neglected sources of Water-supply on Estates and Farms.—Under the first of the three classes I have named—the rain-water shed directly on various surfaces—the source which will at once occur to the minds of most is that of the roofs of buildings. And in hazarding the statement that the great majority will deem this class exhausted when this source is named, I could not perhaps give a better or more striking evidence of the ignorance which so generally prevails on the subject of this paper. But although the roofs of buildings when judiciously availed of is a valuable source of water-supply of the purest and softest kind, it is far from being the only source at the command of the manager of the estate or of the farmer. A walk has but to be taken through the fields of the farm to find in more than one of them, perhaps in all, a hint which, if followed up, will give a source of supply. A further hint he may derive from a consideration of the peculiarities of the rainfall. Both hints point to the taking systematic advantage of ground surfaces as "catch-water areas." Under general circumstances, in conjunction with underground tanks, these will afford stores of water of the best quality; and it will be found by a little careful observation that these stores may also be placed in the situations most useful, as, for example, in pasture-fields for the use of cattle and sheep. This system of "catch-water areas" is capable of a great variety of modifications, the most useful of which, for the purposes alike of the mansion, the farmhouse, the farm cottages, and the farm-buildings, I may hereafter in proper place describe and illustrate. There is, moreover, a good deal more to be said on the best known or the most frequently thought about systems of water-shed surfaces, namely, the "roof catch-water areas," and to this I shall presently direct attention.

Under the second class—rivulet and river—I shall take occasion to point out what I do not hesitate to call the extraordinary sources of water-supply and of *water-power* which are at the disposal of the landed proprietors and the farmers in utilising the rivulets. These are present on nearly every farm, but those which are the most readily, most commonly, and most usefully availed of will be met with in those districts bordering on the hilly counties, and generally in what is known as undulating or rolling land. The works generally done in this class are in the popular mind associated, if not with heavy, at least with considerable expenditure, and also with engineering difficulties of a kind not always easy to be overcome. I trust I shall be able to point out a direction in which a large amount of useful work can be done without involving an expenditure or encountering constructive risks beyond the reach of what I may safely call the energetic yet prudent man.

Coming to the third class, that of springs, I also hope to be able to point at directions in which sources of water-supply, hitherto neglected, and of water-power hitherto seldom used, and in perhaps more than one instance never thought of, may be made available. Of necessity my remarks under all the three classes must be brief, for to give full instructions on all the points of so many subjects would require the space of a cyclopædia. But enough may be given to enable managers to carry the proposed plans out, and to suggest to them modes of working under ordinary circumstances.

Roof-surfaces as a source of Water-supply, and as a method of securing constructive economy.—Under this head in the first class a few sentences will be suggestive, and sufficient, it is hoped, to enable some useful plans to be carried out. Those who have much to do with building property know too well all which is involved in the phrase "keeping it wind and weather tight," as applied thereto. Time lost, temper tried in looking after workmen who do not always work, money spent, and yet after all the wind and weather in some cases keep working out their evil ways.

It may with little hesitation be decided that the most powerful agent in causing the decay of building materials is damp. Indeed it may be said that it is *the* cause, the only one existing, all the others being but offshoots from it, brought into existence by it. If damp had no existence, buildings would be practically, if not absolutely, imperishable. This we find in fact exemplified in the rainless, or nearly so, regions, as Egypt, and certain districts of the vast continent of South America, where mud-walled hovels and cottages are found, although centuries old, as sound as the day the soil or mud was thrown together to form the shelter required.

Properly speaking, it is not so much the damp which corrodes or bites them away, if the expression may be used, as the alternations of dampness and dryness to which walls, &c., are subjected. And as to the action of the damp itself, it is not the moisture or damp absorbed from the atmosphere by the materials which does the mischief, or the major portion of it, but the actual contact of water brought about by various agencies. Of these may be named the rain driven up by the wind, so as to come in contact, more or less violently, with the surface of the stones or bricks, &c., and their numerous joints. The second cause is the rain which is suffered to drop from the eaves, in this case gutterless. These causes work singly or in conjunction in old and neglected buildings; and in buildings which although not old are still neglected, to the great loss of their proprietors; those in many, too many instances being the while singularly indifferent to them, and if not so, labouring apparently under the impression that there is no remedy for the evil.

Of these two sources from which walls, &c., derive the moisture which bring about their rapid deterioration, the second is the most dangerous. Its action is peculiar and is not always considered. I wish to draw attention to this fertile source of "waste," a waste which in more senses than one deserves the epithet of wanton being added to it—wanton, inasmuch as the second of the evils I have named can be easily prevented, and if not absolutely cheaply, relatively so. Indeed, in one sense the remedy will cost nothing, for the cost of putting up the gutters and the down-spouts will be repaid, and far more than repaid, by the abundant supply of rain-water of the softest and for the most part purest water which can be obtained. In other words, the rain-water thus collected will be so valuable that it will pay for its collection. And thus the advantages derived from guttering the eaves, and providing down-spouts or pipes to lead the water off at once to the receptacles or tanks provided for its reception and storing, will be got for nothing. And these advantages are more numerous and greater than many are disposed to acknowledge at the first blush of what they call "so simple a trifle."

Some may maintain that the supply thus obtained from the roof-surfaces cannot possibly be much—in fact some say it is not worth the trouble to collect the small volume obtainable. And to prove this they refer in a very general way to the rainfall. And in truth it is only fair to admit that this is very deceptive; and the ideas formed of it are as numerous almost as are those who take the trouble to think about it at all. But the amount or volume of the rainfall is in point of fact *enormously in excess* of what even the most exaggerated or sanguine of popular estimates make it to be. I need not trouble the reader with figures, which are soon forgotten, I simply state the following concrete fact, which may at least in a general way be remembered. Assuming the daily consumption per head of the rural population in any given district to be very nearly double that at present estimated, and adding thereto the volume of water required by the live stock, and, further, that used by the steam-engines in the fold and the field alike, the proportion which the whole volume bears to that of the rainfall in the same rural district is very small. So small is it, in point of fact, that if we can conceive of the whole volume required in the rural districts to be taken from it, the full volume of the "wants of the district," before it was absorbed by the earth, it would scarcely be appreciated, and assuredly would not in any way interfere with the requirements of "the general water economy" of the district or country. Mr. Bailey Denton, in fact, estimates—and his estimates are always characterised by judicious carefulness—the amount required to be only one-seventyfourth of the rainfall. I have doubled the amount required, or estimated to be required, per head per day of the population, which is surely liberal enough. But when I say that the usual estimate is *far in excess* of that which experience shows to be actually used, one will perceive what small ground there is for holding the opinion that the rainfall of any district will fall short of *all* the demands made upon it, either by domestic requirements, or the general water economy of the country. But it may be said that these calculations, however convincing, refer to the general rainfall on the earth's surface, but give no data for the case of roofs. Refraining again from giving figures, and giving in place a fact, from a pretty wide range of experience it appears to be a rule that in the case of a domestic structure, the proportion the roof-surface bears to the rainfall is amply sufficient to give a supply of water for the consumption of the family which the roof covers. And although the range of experience in the case of farm-buildings has been of necessity much narrower, still it would appear as if the same rule happily existed. The coincidence is more than curious, and ought not to be forgotten in thinking of utilising rainfall on roof-surfaces. It is pleasing to know that the utilising of these is becoming daily more and more frequent; some of the plans adopted being characterised by an ingenuity of adaptation in existing circumstances not often met with in other departments of economy.

From what has now been given by way of opening up the general subject, the reader will be able to perceive how numerous are the points which it involves, how interesting their details, how practical may be their outcome, and yet how, notwithstanding all this, much of which is widely known, there has been a profound indifference to it, the reason for which it has been difficult to account for. Recent experiences have, however, given some clue to this, and it is at least a most suggestive circumstance that practical and technical science has, in taking up and in bringing such wonderful results out of the subject of the utilisation of waste substances, again shown the way by which the best can be made of all the resources placed at man's disposal. It has further shown him how, of all that he has, nothing is useless, nothing is really "waste"—that nothing ought to be wasted. It is to be hoped that the times of agricultural depression through which we have passed, and are still passing, will have the useful effect of inducing those who have hitherto neglected the general system of economical collection and distribution to pay some attention to it now and hereafter. The more deeply they go into its details, the more clearly will the conviction be forced upon them that there is in it—unpromising and uninviting in some, perhaps in many of its aspects—a power for practical benefit, far beyond that which at first sight it promises to yield. Having made it throughout the course of many years a subject of close study, and such practice as professional circumstances permitted, I may perhaps be inclined to give it a greater prominence than it deserves. I, however, venture to say that I do not think so. Certain it is, that however I may have exaggerated the importance of some of its details, it is impossible that I can have overestimated the value of its general principles.

XXII.—*The Management of a Shorthorn Herd.* By WILLIAM HOUSMAN.

OF one who undertook to record things new and true, it was said that he indeed kept his engagement, but that the new were not true and the true not new. Relative to my subject, it is easy enough to provide any amount of matter that is true: to introduce the element of novelty is the difficulty. "My wound is great, because it is so small;" my task heavy, because so light; the materials are all so near at hand that everybody is familiarly acquainted with them already. If it were information to be brought to light from depths hitherto unexplored, one would eagerly toil and moil to unearth it; but I confess it was with misgivings that I first received the suggestion to deal with such common property of the public as the subject of the management of a Shorthorn herd.

The plan adopted has been to visit, in districts wide apart, a few of those farms where Shorthorns are kept, under different systems of agriculture and varying circumstances of soil and climate, and to show what has been done, and what is going on, in those districts. The observations might have been usefully extended, perhaps, to some herds not included; but limits of time, and of the Journal's space, forbade the extension which I would have made very gladly, had it been possible. I hope that the herds which I have taken for purposes of illustration may be found fairly to represent the several systems noticed.

At the outset, I purposed to take either the management of the calf from birth to the end of its life in mature cowhood or bullhood; or the management of a herd from its formation, through the whole course of births, marriages, and deaths; but I soon found that neither of these plans would do, as it is often necessary to know much of the circumstances of a herd and district before we can understand the wherefore of the mode of treatment; so in dealing with the facts noted I throw aside the fetters of the original scheme and proceed to give my notes in any order that seems most suitable to the peculiarities of each case, introducing occasionally a passing remark or two, and concluding with a review of the facts and some comments upon them. The reader may notice that I do not give any details of the training of animals for exhibition. The fact is, training for exhibition, under the forcing system at present in vogue, and likely so to remain, is a matter of special study for each animal; it is an imposition upon Nature, and Nature's forbearance must be watched and sounded. The feeder must heap on the last ounce, short of breaking the beam. There is *no* prescription for the manufacture of prize-winners. We all know the feeding-stuffs that cattle like. If we want to make an animal thick-fat, we must take a few of the most nutritive of them, learn the animal's preferences, and vary the mixture so as to stimulate appetite, remembering, however, that bulk of food as well as quality of food is necessary, and that it would not be nice to live upon plum-cake alone. Exercise, also, must be attended to, and by all means that precious hair must be kept on, even if a glass case be necessary for its preservation. Some such general rules may be laid down, but each exhibitor must work out the details for himself. Some animals make themselves up to the show-mark with comparatively little feeding, and would be overdone and spoiled by much forcing; but it will scarcely be denied that in the preparation of animals for show, cramming is the rule.

In the following particulars of management I am indebted to the owners and managers of the several herds I visited for the ready facilities afforded me of gathering information. In the notes which immediately follow, I am under obligation to Messrs. A. Cruickshank of Sittyton, and J. W. and E. Cruickshank of Lethenty, for details of the management of the Sittyton and Lethenty herds; and I feel especially obliged to Mr. J. W. Cruickshank for valuable hints concerning the plan of this paper and very comprehensive memoranda of the Aberdeenshire system in general. I beg also to express my acknowledgments to those gentlemen not immediately connected with Shorthorn herds of the present time, who have kindly and promptly responded to my requests for information.

ABERDEENSHIRE.

In no part of the United Kingdom has the Shorthorn become more eminently the great rent-paying breed of a large district than in Aberdeenshire; and in no part of the United Kingdom, therefore, has the management of Shorthorn herds taken a more thoroughly business-like turn. The county of Aberdeen has long supplied a large proportion of the beef consumed in London; I believe that proportion has amounted to as much as one-seventh of the entire supply of the metropolis; and this beef is mainly that of Shorthorns or Shorthorn crosses. This vast trade arose from the excellence of the cattle introduced by Captain Barclay, of Ury, about fifty years ago, and the extraordinary power of the Ury bulls as improvers of the stock of the district, for grazing purposes, when crossed either with the pure-bred cattle of the district, or with cows of a mongrel or nondescript class; also from the fact that the soil of the district, when well manured with bones, produces a peculiarly good quality of turnip, and that the oat-straw is also of a more feeding character than that grown in many localities: hence there is an unusually large supply of good and cheap food for winter fattening. The Scottish farmer, keenly alive to any new source of profit, recognised in the heavy-fleshed, kindly thriving, early maturing Shorthorns of "the Captain," as he is to this day called, the means of turning the immediate produce of his land into more valuable human food. The demand for beef stimulated the demand for Shorthorn bulls, and the agriculture of a very large area, in course of years, became adapted to the production of fat steers and heifers of as good quality, as great weight, and as little offal as could be reared in the shortest possible time. Upon the feeding of cattle the farmers now principally depend; and animals bred in the district, and of good quality, are fed off at twenty-four to twenty-six months old. These circumstances should be borne in mind in a survey of Aberdeenshire management. The climate of this, as of every other district, must also be taken into account in considering the treatment of cattle through the various seasons of the year. In the depth of a severe winter the country has almost an Arctic aspect. Sledging is a frequent mode of locomotion. The snow-clad hills, indeed, retain their covering until far into the spring, or even the early summer; and when I visited Aberdeenshire in the middle of May, although the immediate district was clear, some of the more distant heights, notably Lochnagar, still shone out with glistening whiteness in the sun. I need scarcely say, therefore, that the climate in spring is very severe, but may add that the nights become cold also early in autumn. The following table of averages of temperature and rainfall at Aberdeen for the twenty-two years 1857–78, inclusive, will give some general idea of the climate, although it does not record the extent of snowfall nor the lowest temperatures of the winter months:—

	Temperature.			Inches Rainfall.	Number of Days on which Rain falls.
	Mean.	Mean Day.	Mean Night.		
January	37·1	41·8	32·4	2·71	21
February	37·9	43·1	32·8	2·31	19
March	39·6	45·2	34·1	2·32	22
April	44·0	50·7	37·4	2·18	17
May..	48·3	55·2	41·4	1·85	20
June	55·0	62·6	47.4	1·99	18
July	57·5	65·0	50·0	2·47	20
August	56·5	63·5	49·5	3·31	21
September	52·7	59·2	46·2	3·06	21
October	46·5	52·4	40·6	3·19	22
November	40·3	45·6	35·1	3·52	22
December	38·2	43·1	33·3	3·42	21
Total	..	..	..	32·33	244

Almost all Shorthorns in the north of Scotland are owned by tenant-farmers who hold their farms under nineteen years' leases. The principal object in view, as I have intimated, is to produce sires which in turn are capable of producing bullocks apt to mature at an early age, and to carry a great weight of flesh. Style, accordingly, is not so much desired as a short-legged, fine-boned, heavy carcass. Milking qualities are admitted to be highly important, for this if for no other reason—that a good milking cow will give her calf a better start in life than a cow that can barely rear her offspring, and a good impulse to early growth is of excellent effect in the later development of the animal; and not only of the single animal, but of its descendants, inasmuch as propensities gradually called into existence by means of food and management, and artificially maintained and increased through several generations, become hereditary. In Aberdeenshire, however, while the value of milking properties is freely allowed, everything is secondary to heavy flesh.

The land in Aberdeenshire is very various, but principally light and gravelly, forming undulating banks of dry porous soil along the courses of the rivers; and over the district generally it consists of light loamy soil, abounding in small stones, and lying upon a hard stiff subsoil of boulder clay, or upon granite rock. It is very deficient in lime, and does not produce rich natural pasture. There is also an almost entire absence of phosphate of lime, and it is only by the application of large quantities of bones that good turnip-crops can be produced and the pastures made suitable for carrying heavy cattle. There are no extensive beds of limestone, chalk, or sandstone. The land has been drained, and is all under a regular course of cropping; say, the first year, new grass; the second and third years, grass; fourth year, oats; fifth year, turnips; and sixth year, barley or oats sown with rye-grass and clover-seed, in the proportion of a bushel and a half, or oftener nearly two bushels, of rye-grass, say about 45 lbs. (taking the average at 24 lbs. to the bushel) to 7 or 8 lbs. of clover per acre, the clover mixed in the proportion of 4 lbs. red, 2 lbs. white, and 1 lb. alsike.

The country is fenced with stone walls; there are few hedges, and very little wood or shelter of any kind is to be found. The farmyard-manure and most of the artificial manure is applied with the turnip-crop. Almost all the soil is suitable for growing yellow turnips of good quality, and most of it also produces good crops of swedes; the oat-straw is good, and turnips and oat-straw form the basis of all cattle-feeding. No hay is grown, except sufficient to supply the horses in winter and spring, and there is no permanent pasture; rye-grass, together with the small proportion of clover above stated, being the only seeds sown.

The cattle are tied up in stalls for about thirty weeks of the year, and graze for about twenty-two weeks; but, owing to cold and frequent frost at nights, part of even this time is of doubtful advantage for grazing, and cattle for feeding are generally taken in sooner. It is obvious that in such a climate good housing is of great importance. The breeding cows are tied up in byres and have everything brought to them, never being loosed, from autumn to spring, when in-calf. Where, as is commonly the case, there are double rows of cows, the animals stand with their heads to the wall, a "grip" behind separating the two rows. This is generally quite 4 feet wide, and the width of the whole building is from 23 to 24 feet; the stalls measuring 7 ft. 6 in. from grip-stone to head, the trough 1 ft. 6 in., and the width of a stall designed to hold two full-sized cows is about 8 feet. Plenty of room overhead is a great point, with good light and ventilation without draughts. Doors, too, should always be of sufficient width to allow the cattle to pass in and out without injury. The floorings are generally paved with small stones set in sand; if set in cement, still better, so as to prevent the foundation soil from becoming foul.

Young cattle are usually kept in small yards with covered boxes attached; the box is about 16 feet by 14 feet, with a yard of the same size, for four heifers of ten to twelve months. No cattle, young or old, are turned out into the fields during winter and spring. When in autumn they are taken in, they have yellow turnips and oat or barley-straw. The yellow turnips continue good until February or March, when swedes come in to take their place, and are used until the grass comes in May. For some years past, "finger-and-toe" and wet seasons have seriously reduced the turnip-crops of the district, and it has been sometimes necessary to add some artificial food for the cows. The young cattle have always a small allowance up to twelve months old; but turnips and oat-straw are, and long have been, the principal feeding materials to which the farmers of Aberdeenshire trust. The county is essentially a straw-and-turnip district as regards stock-keeping, and this main feature should be steadily remembered. With reference to the kinds of dry food given as a substitute for turnips when the root-crops have failed, I noticed some little variation upon the different farms; but as I shall have occasion presently to glance at the management pursued by several representative breeders whose farms and herds I was allowed to inspect, I will then give some further details concerning these small proportions of artificial food which are subsidiary to the straw-and-turnip system. In the meantime, the following may serve as an average sample of feeding for cows in a bad turnip season:—56 lbs. of turnips *per diem*, given morning and evening, and 10 lbs. of straw, divided over three feeds. In the middle of the day, instead of one feed of turnips, a mixture of 1½ lb. of ground decorticated cotton-cake, and 1½ lb. of oat-husks The oat-husks give little or no nourishment, but they are rough and bulky, and prevent any danger which might arise from concentrated food, such as cotton-cake. In a year when the turnip crop is good, the cows would have turnips three times in the day, about 35 lbs. at each feed, or from 100 to 112 lbs. per diem, with about 10 lbs. of straw (as above), divided over three meals. We shall come to particular systems by and by, but, for the present, to generalise:—the cows are milked between 5 and 6 o'clock in the morning (I may mention that only women milk the cows); turnips are given at 6; the byres are cleaned out, and the animals fed, and bedded with straw: at 11 in the forenoon they are again milked, and at about half-past 12 turnips (if a good turnip season) and straw are again given, and the byres are again cleaned: from 4 to 6 in the afternoon the animals are again fed with turnips and straw, and all manure is removed; and from 6 to 7 in the evening the cows are again milked. When the turnip-crop has failed, some such artificial food as the sample already stated, but chosen according to price and circumstances, is substituted for one feed of turnips.

The system for the young cattle in boxes is much the same as for the cows, except that the heifers have fewer turnips and more artificial food. No linseed-cake is used except for these young cattle, and it is given before they have turnips in the morning. This prevents danger of swelling, which often is troublesome when turnips are given first. In arranging young cattle in boxes, care is taken to sort them according to age and strength, and when one is unfairly treated by others, a change is made until all have an equal chance of food and rest. Young cattle receive some such food as the following, varying with prices and seasons:—heifers, 10 to 12 months old, daily allowance about 1 lb. of ground decorticated cotton-cake, 1 lb. of ground barley or oats (generally the inferior grain which is too light to sell to advantage), 2 lbs. of linseed-cake, ¼ lb. of locust (charob) beans, ¼ lb. of bran, and 1½ lb. of oat-hulls; turnips from 50 to 60 lbs., and straw, of which they eat daily about 5 lbs. or 6 lbs.

A full supply of good clean drinking-water is of the first importance where any cotton-cake is given. When cattle have plenty of turnips they will not usually drink, except, perhaps, when deep milking or some casual drain upon the system causes thirst; but if a supply of water be not within reach of all cattle, especially when kept tied up or in boxes, great vigilance on the part of the herdsman or manager is necessary, on the ground of both humanity and self-interest; for, even when turnips are largely used, they are not always sufficient to meet the demands of nature; and, to say nothing of the cruel sufferings of a thirsty animal debarred from access to water, I have reason to believe that losses to the owner not seldom occur from failure to supply water to turnip-fed cattle. Such animals may often refuse water, but should have the chance of getting it in case they happen to require it.

The calving-time may be considered as ranging from the beginning of September to the beginning of May, but by far the greater number of calves come in February, March, and April: they are reared by their dams; therefore when the cows go out to grass in May they are generally suckling young calves. The practice with regard to the bull varies in different herds. In the large and old-established herd of Mr. A. Cruickshank, at Sittyton, when the cow has calved about six or seven weeks she is turned out with the bull every day; and in summer the bull grazes regularly with the cows. Now of all the subjects connected with the management of cattle, taking the information which I have collected from some of the most experienced breeders in every division of the United Kingdom, there is not one subject upon which the testimony of the different witnesses varies so widely as upon that of the readiness, or otherwise, of suckling cows to breed again. Some affirm that they find no difficulty whatever; that their cows suckle the calves, never see the bull until his services are required, and yet breed again as readily as hand-milked cows whose calves were removed at birth. Others have tried the suckling system, and given it up because they could not get their cows to breed, nor even to take the bull, until the calves were weaned. At Sittyton, where, as throughout Aberdeenshire, all cows suckle their offspring, the cows generally calve again within twelve months of their previous calving. Running constantly with the bull, they come in use sooner than they would if separated from him, and are in no danger of being missed. One bull, under this system, cannot produce so many calves as if he were kept alone and used sparingly in the ordinary way; but the general produce of the herd is increased. Attention must be paid to the bull's feet, or he may easily become useless after winter confinement. When cows turn to the bull frequently, they are not allowed access to him for some time. This may become a veterinary question rather than one of simple management; and in each case the intelligence of the manager, and the result of his careful observation of the animals, must determine whether professional advice is necessary.

When the cow calves, the calf is tied up beside her; and for some time, until it is well able to take all her milk, the cow is regularly milked—*the calf sucking at the same time*, so that the cow cannot retain her milk. When the calf can manage all the milk, it is allowed to go loose about at will, one stall being left for the use of cow and calf. The theory is—and I believe it to be perfectly true—that many of the frequent and discouraging losses among young calves are caused by the allowance of too much milk at a tender age. The calves should be kept hungry, that is, never allowed to satisfy themselves, for the first three weeks of their lives. Scouring and indigestion, with consequent formation of hair-balls in the stomach, arise from too liberal or irregular feeding. When the cows go out to grass, the milk generally increases, and sometimes it is again necessary to resort to hand-milking to take away the surplus. After the calf is weaned, the cow is regularly milked three times in the day. Indeed at all times care is taken to relieve the cow of all her milk.

The calves are trained to eat oilcake and sliced turnips as soon as possible, and are weaned at from seven to eight months old. The young bulls which are to be sold in autumn generally get some oilcake in the fields during the later summer, and the heifer-calves depend upon their mothers and the grass.

The heifers are generally put to the bull so as to calve at from twenty-four to twenty-six months old. This early breeding tends to reduce size, and must be met with liberal feeding. When, however, the breeding is put off to another season, the risk of permanent infertility is greatly increased; and a year's rest at three or four years old generally enables the animal to come to its full size.

Little or no trouble is experienced from the infertility of bulls, which are kept as much as possible in even condition, neither very fat nor very lean; but heavy losses arise from cows slipping their calves. It has been noticed that casting is the more common in years when there is a large supply of turnips and a small crop of straw. Whether this is from any real connection of cause and effect, or whether the assumption that such is the case is a too hasty conclusion—*post hoc ergo propter hoc*—drawn from the insufficient evidence of several remarkable coincidences, the Aberdeenshire stock-owners are quite sound in their practice of noting those coincidences, and so varying the keep of their cows, in seasons of the kind, as to endeavour to counteract the possible evil effects of a superabundance of turnips and a scarcity of straw. "Foot-and-mouth" distemper, that undermining destroyer of our herds, has wasted those of Aberdeenshire extensively and repeatedly; and here, as elsewhere, much of the abortion and barrenness of cows was traceable to this malady, which townspeople and the public generally supposed to be a mild, harmless complaint, because, forsooth, it seldom killed outright the visible stock upon the land, but which the breeder and the grazier knew to be one of their worst enemies. This trouble, however, now that the working of the Cattle Diseases Act has reduced it to very narrow limits, is almost forgotten.

Very few calves are lost, either at birth or afterwards; but "quarter-ill" is in some places still troublesome to the farmers. A small daily allowance of oilcake, and the use of an issue (a seton) in the dewlap of the calf, is usually found sufficient to check it. The severe climate causes much rheumatism among young bulls, and it develops much in the way that the disease known as joint-felon does in Yorkshire. Moderate feeding and regular exercise are accounted the best preventives.

By the most experienced and most successful breeders much stress is laid upon the maintenance of unchecked progress in young stock; and it is held that in feeding young cattle, if a loss of flesh be allowed to occur, it never can be altogether made good again. This may seem to be rather strongly stated, especially in connection with what has been said just before about a check in the attainment of size, by early breeding, being made good by a year's rest at three or four years of age; but I believe it will be found to bear examination. Those who have carefully watched the growth and development of cattle will allow that it is at least much easier to make up lost time, as regards growth of frame, than to restore flesh wasted at an early age. Particular care, therefore, is exercised at weaning-time to feed as well as possible, and the calves are still kept tied up beside the dams, so as to have their companionship for awhile, thus avoiding the violent break of a sudden separation, with the bellowing, the pining, the refusal of food, and consequent loss of condition, so frequent when the parting is not effected thus gradually.

The foregoing remarks, applying generally, with little variation, to the whole of the great breeding and feeding district of the north of Scotland, have more particular reference to the Sittyton, Clyne, and Middleton farms, in the occupation of Mr. A. Cruikshank. Any slight variations noticed upon other holdings visited I will state presently; meanwhile I may say that the above farms comprise altogether about 600 acres, of which the cultivated parts, that is to say, the entire farms, exclusive of roads, area of farmsteads, and similar deductions from the total acreage, may be divided thus:—

	Acres.
Oats and barley to supply straw	200
Sown grasses for pasture	270
Turnips	100
Hay for horses	12
	582

The average stock of cattle and horses together, taken at Whitsuntide, may be put down roundly at 150, exclusive of the calves and foals of the season, which, as being then dependent entirely upon their dams, are not counted as food consumers. If the average were taken at Martinmas it would be considerably higher, as the young stock of the year would by that time appreciably assist their parents in the consumption of the direct produce of the land, and the annual reduction of number by sale would not have taken place. The following are the exact numbers of cows and horses, exclusive of calves and foals, but including all other ages, taken at Whitsuntide in the last two years, and the numbers this year, which I cannot state exactly, are about the same:—

	Cows.	Horses.	Total.
1878	122	25	147
1879	127	27	154

The staff of men permanently employed on the three farms numbers 14, on the farms respectively 6, 6, and 2. On all the farms together, 5 men are employed during winter solely about the cattle. Of the pleasant relations of master and servants, and the interest of the former in the welfare of the latter and their children, it would be out of place to speak more particularly here, although I would submit that I am quite in order in thus briefly referring to a state of things which ensures the hearty devotion of the labourer to his employer's interests, a matter of no small moment where so much watchfulness and painstaking care are required as in the management of a Shorthorn herd.

Closely similar in detail is the management upon the farm of Mr. Alexander Davidson, Mains of Cairnbrogie, Old Meldrum. The principal food, however, in lieu of turnips, or to make turnips eke out in a bad turnip season, is bran. No cotton-cake is used. The bulls are kept in the house, tied up in the same byres with the cows, never allowed to run loose with them in the field, but led out to them in the field for service. Mr. Davidson does not often find any difficulty in getting his suckling cows to breed again within a reasonable time after calving.

My general notes will also apply to the management of the herds of Mr. William S. Marr, of Uppermill, Tarves, and Mr. Sylvester Campbell, of Kinellar, Blackburn, and the principal variations in particulars are much the same as at the Mains of Cairnbrogie. At Uppermill the bulls are not allowed to run out with the cows. The chief substitute for turnips in a bad season is a mixture of bran and chaff, sweetened with treacle. On most of the Aberdeenshire farms is a threshing-mill, worked by either water or horse-power. The mill at Uppermill is a specially good example, with its ample water-power. At Kinellar there is a threshing-machine worked by an 8-horse power portable steam-engine, occasionally doing duty among the neighbouring farmers. Mr. Campbell's substitutes for turnips vary a little from those already specified, but are of a similar kind.

NORTHUMBERLAND.

The county of Northumberland, rich in Shorthorn historical associations, affords examples of management under an altogether different state of affairs. Nowhere, perhaps, was the combination of dairy and grazing properties more completely effected—both of them in the highest possible degree of development in union—than in some of the old herds of this county. The herd of Messrs. Angus, of Broomley, of former years, was a notable example of what may be done in this respect; and Mr. John Angus, of Bearl, has still a herd in the management of which he endeavours to follow as far as possible the traditions of his district and family. In some modern herds, a great demand for Shorthorns at high prices having sprung up of late years, the temptation to comply with that demand has induced breeders to neglect the "weeding" which is necessary in order to keep up a herd to the highest point of excellence; and this, although it belongs to the subject of breeding rather than of management, is so important a condition of the success of management, that I cannot omit a passing reference to it. Mr. John Angus, of Bearl, and his brother, Mr. Jonathan Angus, of Newcastle (the latter not now connected with Shorthorn breeding, but perfectly clear in his recollections of Broomley), both confirmed the reports I had previously heard, that the old Broomley cattle were almost invariably not only good, but really deep milkers, yet of the true grazier's type, square-built, wide chested, with big ribs and well-covered backs. The bulls were of masculine character, not too fine and neat, yet not coarse in the bone.

Broomley and Bearl lie on opposite heights, Broomley on the right, Bearl on the left, of the beautiful river Tyne, with Bywell, its castle and two churches, the latter in curiously near neighbourhood, lying in the intervening valley, just above the bridge by Stocksfield-on-Tyne railway station. Broomley may be seen from the road close by Bearl. It is high and much exposed land, and the crown of the hill at Bearl stands out bare and bold. The district is a comparatively dry one. The practice at Broomley was to have the cows calving from the beginning of January to the beginning of May, which they did almost without an instance of failure. After the calves "got upon their legs," they were kept on skim-milk and boiled linseed until August, when they were weaned, and they were substantially wintered on hay and straw without artificial food of any kind, and at two years old the best heifers were selected and brought to service. Here was a process of selection constantly going on; each crop of calves tried and sorted, the worst rejected and the best retained. The young stock did not go out in winter except to water. They were kept in large open yards with a comfortable shed, and were always to be seen in fair store condition. The cows were never housed, even to be milked, during summer, and were not brought in at night until about the 11th of November (Martinmas, the traditional time for lying indoors in the district), and in winter they went out regularly through the day, and had their one feed of turnips laid out in a grass-field, after which they were allowed to regale themselves on chaff in the barn-yard. This, with liberal supplies of good meadow hay, was their sole diet. Linseed-cake and other artificial foods they never tasted.

There is no recipe for the production of cows that can fill the dairy, breed the primest steers, and make good beef when they have done breeding; all must be done by judgment acquired only in practice. But there are certain rules which cannot be set aside with impunity. If, for instance, heifers be forced for show or sale, or to make "flat-catchers," all chance of developing their milking properties should be abandoned at the outset. Indeed, such over-fed brutes rarely make good breeders of beef-stock, inasmuch as the constitution is sapped, an unhealthy tendency to grossness is induced, and the reproductive powers are consequently impaired. On the other hand, starveling heifers, I have already assumed, can never regain the muscular tissue once lost while the frame is growing; they may make milkers, but they cannot make fairly representative grazers. The happy medium of liberal but not extravagant keep; early use of the milk-secreting organs by early breeding; frequent and clean milking, to stimulate the flow of milk; especial attention to the fore-bag in heifers at calving; and the use of such foods as support and sustain the animal while increasing the yield of milk, are among the means of making dairy-and-grazing Shorthorns. The land also has much to do with this. Some lands are quite unfit for the rearing of stock intended for the dairy, while other lands cannot grow good beef-cattle. If the intention is to try to combine milk and beef on either sort of land, artificial feeding must be the resort; but the best policy of the farmer, doubtless, is to breed for milk or beef, or the two combined, according to the capability of his land and the market facilities of his district. As a rule, the man who tries to breed a milking type of Shorthorn falls back upon the old unimproved wedge-shape—light, shallow, narrow fore-quarters, deeper and wider hind-quarters, plenty of paunch, and a deficiency of thigh. This may do for the dairyman, but it will not suit the grazier or the butcher. With those who say that in order to breed the best butchers' beasts you must utterly sacrifice milk, the traditions of Northumberland are entirely at variance. They instruct us that in order to have a dairy cow of even the first class, it is not absolutely necessary to have a wedge, with the dewlap for an apex. You may even venture upon a big girth and ample crops, and you may grow admirable rounds of beef; but let beef be the first consideration, and milk claim due attention when the frame for beef and the generous disposition to thrive are secured.

I have alluded to the intimate association of the subjects of breeding and management, and the difficulty of keeping clear of the former while handling the latter subject. But it may be truly said, moreover, that the best part of breeding *is* neither more nor less than *management*. If we consider the earliest improvements of breed, the question arises, how were they effected? Simply by *management*. There is really no mystery in what is called "blood." Good land, liberal keep, stimulated the digestive powers to greater action, resulting in larger and better nourished frames and larger capabilities of sustaining the offspring. These propensities, cherished through successive generations, became hereditary, and selection did the rest. By the same processes we might in course of time raise highly improved breeds from the very commonest stock in the country; but we have, in the breeds already improved, a long start of any one who would begin *de novo*, and we find it therefore convenient to make use of the work already done, the good materials plentifully at hand.

Several of the farms upon which Shorthorns have been successfully kept in Northumberland lie at heights of five or six hundred feet above the sea-level, in districts where the average rainfall of the year is fully 27 inches. I have selected as a notable illustration of management in this county the herd of the Duke of Northumberland at Alnwick Castle, where the height of the land occupied by the Shorthorns varies (upon the whole a fair medium, not in any case extremely high or low) from the "haugh" down by the river Alne to the high land of Bassington, about 200 feet above the sea, an airy and a healthy place, with an average rainfall of about 25 inches. The Alnwick Park herd, kept with a view to practical utility, has nevertheless turned out winners at the exhibitions of the Royal Agricultural Society of England and other leading associations; and as an inspection of the cattle on the farms enabled me to observe that the few show animals are no more than fair average specimens of a good working herd, I was glad to have the opportunity of obtaining from Mr. Patten the following particulars of his management.

The principal object is to develop the growth of beef rather than milk-production; yet many of the cows are excellent milkers, rearing their own calves; and often, during the height of her milking, a cow will have an ample supply for another besides her own. In almost every instance the cows are allowed to suckle their calves. This plan is found to be a safe one for both cow and calf, and since it was fully adopted, the loss of a calf has been very rare, and no Shorthorn cow has died of milk-fever for many years. As safeguards against this cause of loss, the precautions of limiting the cows in their food a few days before and after calving, and giving laxative medicines at that time, are strictly observed. The calves remain with their dams for six or seven months, when they are weaned, in order to rest the cow before she has another calf. Mr. Patten is most distinct and emphatic in declaring that the suckling system does not prevent the cows from coming in use readily. His own experience is that the average time of their taking the bull does not exceed two months after calving, and as a rule each cow produces a calf every year. The food of the cow in winter, when she is in-milk, consists of hay with an allowance of two mashes (a mixture of bran and bean and Indian meal), given night and morning; and when not in-milk, it is hay and 2 or 3 lbs. of linseed-cake in the day. When turnips or mangold-wurzels are plentiful, an allowance of three or four stones *per diem* to each cow has a most beneficial effect. An "outrake" in winter, where a good deal of rough herbage has been left from summer, is considered almost indispensable, especially if no roots are given. During the summer months no artificial food of any kind is used.

The heifers, whose food is similar to that of the dried cows, are usually put to the bull when eighteen months old, as any further delay is found to increase the risk of barrenness, especially if the animals are in high condition, as will usually be the case with heifers bred from stock selected for their readiness to thrive, and kept in the manner described. Mr. Patten concurs in the opinion of those who maintain that premature calving is frequently the result of inferior food, of mouldy hay in particular, and he strongly insists upon the necessity, for successful management, that all the food shall be of good wholesome quality. It has been seen that in Scotland, casting is often attributed to an unduly large proportion of turnips over straw (or perhaps it should be stated the other way, too little straw in connection with an abundant supply of turnips); but Mr. Patten's observations in Northumberland (a grass and hay, not straw and turnip district) go to show that the evil of premature calving is always more prevalent during a winter following a bad hay summer than at any other time. He maintains also that the excessive feeding for the showyard, and the practice of allowing cows in-calf to remain out through the cold nights in autumn, are frequent causes of abortion.

The importance of retaining the "calf's-flesh," that layer of fine elastic muscle so agreeable to the touch, and, in its effects as regards the animal's looks, so pleasing to the eye, is fully recognised at Alnwick Park; so likewise is the *difficulty* of retaining it. The calves, after weaning, receive special attention, for, although liberally fed, they are apt to lose much of their plump and bloomy appearance. It is an excellent plan, Mr. Patten finds, *before* weaning-time, to accustom the calves to eat the same kind of food that will be given to them *after* weaning. He recommends (and uses) 1 lb. to 2 lbs. of linseed-cake *per diem*, with some sweet hay, and a few slices of mangold. This proves to be a good diet for newly-weaned calves. When a little older, they may have coarser food with advantage. A lot of ten came forward to grass in the spring of this year in nice condition, their food in winter having been inferior hay, scalded, and mixed with a little Indian meal, served twice a-day, and in their racks oat-straw *ad libitum*. By thus cooking or scalding the worst part of the hay, and so destroying its injurious properties, he obtains for the young stock a very useful article of food.

NORTH-WEST OF ENGLAND.

Crossing from the north-east to the north-west of England, we have in the "over-sands" nook of North Lancashire one of the most noted bull-breeding herds in the country, that of the Duke of Devonshire at Holker. Its character, as thus intimated, will be remembered in connection with the management about to be described; for in all these particulars of the system adopted in each herd, it is most essentially important, in order rightly to appreciate the practice, to bear in mind the main objects that the breeder has in view.

The average rainfall at Holker is great. The average temperature in the different months of the year is given, in the following table, over three not consecutive years, but the two last years are taken, and the year 1875 introduced for the purpose of comparison. The rainfall in each of these years is added. Holker is situate at the head of Morecambe Bay, and in the close neighbourhood of the Lake Mountains, where showers and rainy days are frequent. Part of the land is park and other permanent grass, part arable, and part recently reclaimed from the Bay and laid down to grass; but I have no memoranda of the proportion of each.

TEMPERATURE at HOLKER.

	1875.		1878.		1879.	
	Max.	Min.	Max.	Min.	Max.	Min.
January	51°	18°	51°	20°	45°	13°
February	55	23	55	26	48	22
March	58	24	61	22	60	21
April	74	28	69	27	59	23
May	74	36	71	31	67	25
June	79	42	90	35	74	35
July	79	43	94	41	78	47
August	75	44	82	45	81	39
September	77	41	74	36	72	33
October	66	32	70	26	66	27
November	57	25	52	24	56	21
December	55	19	46	10	49	11
Rainfall	In 1875	Inches. 40·53	In 1878	Inches. 39·31	In 1879	Inches. 37·432

Mr. Drewry, whose position as the Duke of Devonshire's estate agent afforded him the opportunity of establishing, and enables him to maintain under his direct personal superintendence, the well-known herd, found good Shorthorns when he came to Holker many years ago; but he foresaw the advantages of following a different line of breeding; and the averages of public sales of the Holker Shorthorns (to say nothing of private transactions) have emphatically vindicated his judgment. In the details of management, as well as in the broader principles of breeding, he takes a lively interest, and probably this readiness to become familiar with *minutiæ* goes far to account for the success of his undertakings in general. His plan of rearing Shorthorns is usually, in the first stage of life, by suckling, which is considered the best and cheapest method. Many heifer-calves are reared by putting them upon little Scotch or half-bred heifers. When a bull is reared for use in the herd, suckling is considered preferable; when one is intended for sale at or under twelve months old, he has usually reason, as Mr. Pumblechook told Pip, to be "grateful to them which brought him up by hand." The calves are not often allowed to suck their dams more than a month, and those which are reared at the pail do not suck at all. The objection to the calves sucking their mothers is, that the cows do not come in season while the calves are with them.

The heifers are generally brought to service at eighteen months, or from that age to two years old; but this depends upon their previous growth: if they are strong and likely to grow large, they are brought into profit early; if not so large as desired, they have more time allowed to get their growth. As soon as the calves can eat, in winter they have a little cake and hay, or crushed corn. Those under twelve months old do not go out during the winter months. As soon as there is grass in the spring, those which are a year old are turned out to grass, and get no other food. The same remarks apply to bulls, except that they are better kept than the heifers. The calves are setoned about three months old, and the setons kept in till they are eighteen months, to prevent quarter-evil.

The cows are milked twice a-day. If they are *deep* milkers, they generally have a little cake or corn, and when the pastures begin to fail, the allowance is increased. The times of lying out in spring, and night-housing in autumn, depend upon the weather and the condition of the cows. If a cow is not milking, and not due to calve until the spring, she probably lies out until Christmas, without any other food than grass. Cows in-milk are generally taken in at nights about the end of October. If the winter is dry, the cows are frequently allowed to go out for an hour or two each day, when fine; but if it is wet and cold, they are only let out to water once a day. Garget, in July and August, is the worst complaint among cattle in the district. The stock-bulls are generally turned out for two or three months in the summer, with sheds to which they have access at will.

We have some special features of locality and climate, consequently of management, in the strip of country in Cumberland, bordered westward by the sea, and to the east by a range of green, bare, pastoral fells, running northward from Black Comb towards Wastwater, at heights varying up to somewhere about 1500 feet, thus hedging off from the Duddon Valley the narrow vale through which flows the river Esk beneath the woods of Muncaster. One of the most notable herds in this district is that of Mr. Henry Caddy, of Rougholm, founded by his father many years ago. The farms in Mr. Caddy's occupation are altogether about 900 acres; Rougholm and Hall Waberthwaite, both his own property; Dyke, belonging to a relative; Graymains, one of Lord Muncaster's farms, and Nether Stainton and Ellerbeck, rented of another proprietor, Mr. Nicholson. Besides these enclosed lands there is an unlimited right of fell pasturage. The higher fell supports a flock of Herdwick sheep, and the Shorthorns and a herd of Black Polled Galloway cattle have the lower lands and the fell up to, say, 500 feet. The general character of the country, its wildness and seclusion, may be inferred from the fact that a year or two since a strange wolfish-looking dog, evidently a foreigner, and by the inhabitants supposed to have come ashore from some Baltic coaster, suddenly appeared on the fell and commenced devouring the sheep: the farmers of the fell dales and their servants turned out in pursuit with guns, but for days the chase was in vain, and before the marauder could be destroyed he had killed about 200 sheep. Far up such heights, the Shorthorns roam for their living. Now here is a very noteworthy circumstance.—The late Mr. Caddy, who delighted in a good cow, but thought nothing of one that could not fill the pail, reared his young stock on very short allowance, and kept his breeding cows on low diet through the winter; this was according to the tradition of the district concerning the capabilities of his land, and he maintained that he was obliged to follow that system as the only profitable one. His son, on coming into possession of the property, and inheriting his father's taste for Shorthorns, was induced to try the effect of more liberal keep in winter and more generous rearing of his calves. The experiment was fairly tried out, and is now abandoned as a complete failure. The sour land cannot keep up the impetus to growth and thriving imparted by the artificial feeding indoors, and there was no choice but between a ruinous artificial system throughout the year, and the old system of low keep. To the latter Mr. Caddy returned, with satisfactory results. The land, unable to support artificially fattened cattle, has nevertheless a remarkable virtue in bringing out lean cattle during the summer months, and it is wonderful to see the progress made by the poorly kept cows and cheaply reared heifers between the first flush of grass in spring and lying-in time in autumn. The farm stock consists, on the average, of about 130 or 140 cattle, 17 horses, 1000 Herdwick sheep and 100 half-bred sheep, by Leicester or Shropshire rams from culled Herdwick ewes, the main flock of Herdwicks, of course, being kept always perfectly pure. Of the 900 acres, about 25 are out of ley, 100 altogether under the plough in the following course:—first year, oats; second, turnips, rape, mangolds; third, wheat or barley; fourth, seed grass, mown or pastured.

The herd, a highly-bred one, and comprising representatives of high-priced families, is essentially a dairy herd. Milk, indeed, here is the *first* object; and it is worth notice that, in seeking it, Mr. Caddy has not selected cows of the wedgy, dairy type, nor of the families most highly reputed for milk as opposed to the families primarily famous as beef-makers; on the contrary, a glance at his pedigrees will show that he has actually taken the reputed beef-makers for his purpose, and used bulls of notoriously heavy-fleshed families. Upon his land, and under his system of keeping the heifers in poorish condition and the cows low in winter, he can make Shorthorns milk to any extent; and he cannot afford to lose the feeding propensities of the breed. The danger of his system is that with unskilful management the cattle in course of time would degenerate into mere milkers, shallow and narrow-fronted and light-fleshed; but this he does not permit, for he knows too well the true form of the improved Shorthorn, and aims to maintain it, while cultivating by all possible means the dairy properties.

The cows are hand-milked, and the calves reared by the pail. From three or four days old the calves are tied up, two or three in a loose box at first, and afterwards, when they get size enough, in little stalls made purposely for them, with rack and trough; a most old-fashioned-looking row of babies,—so staid, with quite the manners of grown-up cows. For some time past the mortality has only been one in seventy, but formerly it used to be much larger. They sometimes suffer from scour (for which castor-oil is the medicine used), but rarely from hair-balls. They have milk twice a-day; at first one quart of new milk in the day, increased to two and then to three quarts, as the calf's capacity enlarges; but about three quarts is the maximum quantity of new milk, which when they reach the age of about six months is gradually changed to "blue" or skim-milk. As soon as they can take it, a little oilcake and hay are given; the calf at (say) four months old getting about half-a-pound of oilcake as the day's allowance. From six to twelve months old they have, with three quarts .of skim-milk at each end of the day, porridge of oilcake-dust, with wheat, barley, and Indian corn all ground together; and when skim-milk is plentiful, the allowance of it sometimes exceeds three quarts at the morning and evening meal. The early-spring calves (born in January and February) go out in the summer, but come in at nights; those dropped later stay indoors over the first winter. The calves of the previous autumn not only go out by day, but lie out at night in the middle of the summer. The cows lie out from the end of May or early part of June, according to the season, until the end of October or beginning of November. In some exceptional cases, cows in-milk, lying out, have 1 lb. of cotton-cake daily; during the lying-in months, turnips and "orts"—a term in the North of England for waste hay or straw, the leavings of cows in the byre. Formerly, the turnips used to be pulped and the "orts" cut, but this practice has been discontinued for the last two years, Mr. Caddy being persuaded that cattle do better and are healthier upon food given in a less artificial state. The worst complaint known in the district is red-water, in highly-fed heifers; so that Mr. Caddy's system of moderate keeping tends to reduce greatly the risk from this disease. Quarter-ill is little known: in the course of his farming Mr. Caddy has only lost three from it.

A drive of a few miles northward from Rougholm brings us to Hall Santon, where Messrs. Gaitskell farm their hereditary property, and keep upon it a herd of Shorthorns, the bulk of which is in the ordinary condition of dairy stock, *plus* the flesh that well-bred Shorthorns will grow while common-bred cattle would remain in a lean state. Occasionally an animal is exhibited, and prizes have been won at the national, the county, and the local shows; young bulls are reared, hardily and healthily, and go among the farmers, to become the sires of useful milking and grazing stock, and some calves are made steers. The cows during summer have little if anything more than grass; during winter, when they lie in old-fashioned, under-housed byres, with stalls divided by freestone flags, they have pulped turnips, cut "orts" (hay or straw), with Indian meal, crushed oats, oilcake, and cotton-cake, the decorticated being always used. The bulls are kept indoors, chained in separate boxes. In one bull-house there is, for the contingency of a bull becoming unruly, an arrangement for feeding him without going into the box—but this does not work well. It will be readily understood by those much among cattle and acquainted with their dispositions, that if a bull has any shyness or other infirmity of temper, the only chance of keeping him under control is to be frequently with him, exercising firmly, but kindly, a master's power. The "awkward" bull must be accustomed to have the man about him, or the scene will be a stormy one when the man eventually has occasion to approach him. The solitary cell system does not do in such a case.

The cows are hand-milked and the calves pail-fed, except when some particular favourite is brought on for show, or is for any other purpose encouraged to do its best as regards outward appearance. The dam, in that case, is sometimes allowed to suckle her calf; but the suckling system is avoided as much as possible, for the reason that the dam, especially if she is a heifer with her first calf, does not take the bull readily while rearing the calf. The milk given to the pail-fed calves is one, two, or three quarts of new in the day, according to age, as at Rougholm; but the Hall Santon calves do not get milk so long as those at Rougholm, for their new milk, when they are a few weeks old, is mixed with skim-milk and a little linseed added, until about six months old, when the milk is stopped altogether. The young bulls are kept in wooden sheds, open to the weather at all sides and ends, except that sometimes in the depth of winter sacking is tacked on to the north side of the sheds, which are lathed at the top with hooper's chips, to turn the rain, and small larch-branches are used to cover this slight roof. A great part of the land in the neighbourhood is in its natural condition little more than sand: a whirlwind has been known to carry a large portion of a field over the fence and deposit some hundreds of cartloads on the adjoining road, so that it was a work of considerable time and labour to cart the sand back to its proper place. Messrs. Gaitskell have, however, a hill of good stiff soil on their property, and this they have skimmed, and are continuing to use in the same way, each year taking a sufficient quantity to mix with their farmyard-manure. A space *below* the midden-stead, at a short distance, is set apart for it, the liquid manure and oozings from the midden being brought down to it, the solid manure eventually mixed with the soil, and the whole applied to the land, thus not only fertilising, but causing that cohesion which is wanting in the sandy surface in its original state.

SOUTH-WEST OF ENGLAND.

From the north-west I will, with the reader's consent, travel directly into the south-west of England, and describe what is going on among Shorthorns in Monmouthshire, Gloucestershire, and Somersetshire.

The late Mr. Richard Stratton, holding at different times farms in the counties of Somerset and Wilts, was one of those skilful and fortunate men who have contrived to make a handsome profit out of agricultural pursuits. As a Shorthorn-breeder he was no less successful than as a farmer; and he had the rare credit of raising, from combinations of materials in the acquisition of which his judgment spared his purse, a herd brilliantly successful at the leading shows. Since his death two of his sons, Mr. Joseph Stratton, of Alton Priors, in Wiltshire, and Mr. Richard Stratton, of The Duffryn, Monmouthshire, have ably carried on his line of breeding and traditions of management, winning numerous prizes, including on several occasions the principal prizes and champion honours of the Smithfield Club. This proves that the animals of Messrs. Stratton's breeding and rearing can make beef; and an inspection of their herds and farms has enabled me to say that the milking properties of many of their cattle are so great that it seemed questionable whether dairy or grazing properties formed the leading feature. The animals in both herds are of similar character; and as I do not wish unnecessarily to multiply examples, and the Alton Priors herd, I regret to say, is about to be dispersed, I will take the management at The Duffryn for my illustration.

The Shorthorns at The Duffryn are made subservient to the general farm management, and treated as ordinary cattle—except the one or two specimens usually kept for exhibition. Mr. Richard Stratton is a tenant-farmer, with his rent to make by farming, pure and simple. He considers that with the best of blood and the best type of beef-making Shorthorn it is possible, under judicious treatment, to combine good milking properties, and that the less artificial the keep of breeding cattle the more satisfactory will be the result. In support of his theory about the combination of milk and beef, he can triumphantly point to numerous examples on his own farm, and Mr. Dampney, who has used the Messrs. Stratton's bulls for five-and-twenty years, and many others, have raised herds of great milkers. Mr. Stratton has at The Duffryn and other farms about 1300 acres in hand, of which 700 are in grass (some roots grown for the milk cows), and he keeps 200 head of cattle and 800 sheep (these not kept exclusively on the grass), Cotswolds, to be worked into Downs on the out-farms, and Shropshires at The Duffryn; about 25 horses, including 15 colts and fillies, as he breeds each year 4 or 5 foals out of working mares. He works also by steam-power, with Fowler's 6-horse engines. The land at The Duffryn is a loam, partly on clay, partly on gravel. Ifton Hill, a distant farm, close by the Severn, and running down to it from a height of about 100 feet above the sea, is partly on the limestone and partly on the same formation as The Duffryn. There are salt marshes at both places. The Duffryn is flat, and, as its name signifies, low-lying land. Castleton, Mr. Stratton's third farm, on the Old Red Sandstone, lies high, and the young cattle and sheep are chiefly kept there. The salt marshes and "moors" run down to the Bristol Channel, forming part of Wentloog level.

Mr. Stratton has a milk trade with Newport, The Duffryn farm supplying the milk, while, at one of the other farms, cream-cheeses and Devonshire cream are made, forming auxiliaries to the milk trade. A supply of milk is required for winter and summer, so the cows calve at all times of the year.

All calves are suckled by their dams for some time; the heifer calves usually about four months, more or less, the bulls longer (about six months), and if more milk is required to meet the trade, the plan is to take off a heifer-calf or two. In future, however, with the cream and cream-cheese trade developing at the other farm, the practice there will be to wean at one week old on skim-milk, with linseed-meal or other substitute for the cream taken off.

The cows are always (unlike the Scotch system) milked by men, who go round before the calves suck, and take a portion of the milk from the deep-milking cows. The calves are kept during the first winter in a yard or shed; afterwards, Mr. Stratton's favourite practice is to keep his cattle as much as possible in the open field, with good sheltering hedges, no sheds. He likes the hedges better than sheds; and he holds that if the animals get a little cut up in winter they thrive all the faster when summer comes. For about two months in the dead of winter the milk-cows and calves of the first winter are kept indoors; all the rest of the female stock (except the one or two for shows) "roughing it" in the field. To the cows indoors a supply of water *ad libitum* is allowed. It stands before them all, and they can drink whenever they please. The heifers generally produce their first calves at about two years and nine months old. With suckling dams, some little delay is occasionally experienced in breeding again, as they will not always take the bull before their calves are weaned. The indoors diet for those that require it is hay, roots and meal (or crushed oats), but this, with the exceptions already specified, is not given to anything in larger quantity than would be given to the commonest dairy cattle. Even the young bulls are not got into more than ordinary working condition, but are reared so as to make satisfactory bulls for farmers.

Mr. Thomas Morris, of Maisemore Court, near Gloucester, keeps a herd of Shorthorns of about 130, or rather more, as the average number. The herd was founded by his father, in the year 1828, by the purchase from Mr. Strickland of two pure-bred cows, from which all the cattle now comprised in it are descended, with the exception of stock bulls. These, for the necessary changes of blood, are obtained from other breeders. The main business of Shorthorn breeding at Maisemore is the production of good bulls for ordinary farmers, and they realise at one year old averages of 30 guineas and upwards. The highest year's average for young bulls sold in one year was 48 guineas. The bulls, to meet the demands of customers, must be of large scale, healthy, robust, kindly thrivers, and of good dairy families: for such Mr. Morris has a ready private sale among tenant-farmers. He farms about 600 acres; but as hay of indefinite quantity is sold, and sheep are kept, I am unable to give with sufficient accuracy for my purpose here an estimate of the acreage fairly apportionable to the Shorthorns, which have the range of good grass-land.

The calves are not suckled. Besides the profit from the sale of young bulls, the sale of butter is a source of income, and for this object, necessarily, the cream is taken from a large proportion of the milk. The bull-calves, nevertheless, are brought up liberally, to make them useful and saleable at twelve months old. They have new milk at first, gradually changed to skim-milk, or new and skim-milk mixed, as they grow old enough to take dry food, and then various meals (barley-meal, pea-meal, &c.) are given. The heifer-calves have new milk for about a fortnight, then changed to skim-milk by degrees, but within a few meals, and a very little cake and some chaff (cut hay) and dry bran, mixed, are supplied as the calves can take them. They lie indoors the first winter, afterwards are turned out to grass.

The heifers thus moderately reared are put to breeding when about two years and three months old, so as to bring their first calves when they are three years old.

The cows, being milked by hand, return to breeding soon after each calf, breed regularly, and generally calve again within the year. When they cease to be profitable as breeders, or when, young cows coming forward, there is a surplus stock of females, the cows no longer required are fed off and sold to the butcher, so that Mr. Morris never needs to have a public sale, his principle throughout being to treat pedigree Shorthorns as ordinary farm-stock, and make them pay rent and profit in the regular course of farming. The old cows made fairly fat realise from 30*l.*, which is about the minimum value, up to 40*l.* for extra-large cows, or any cows that have a little more than ordinary feeding. The cows lie out-of-doors at night from the first week in April to the beginning of December, in average seasons (subject to variations of a few days at either end of the grass season, according to the weather), and in winter have roots and hay.

The stock-bulls are kept in boxes, and, if very quietly disposed animals, are turned in loose; if, as is frequently the case with old bulls, inclined to use their heads, they are, although not vicious, tied by the neck by way of precaution. They are never led out for exercise; only for use. This I am bound to mention as a fact in the management, certainly successful management, at Maisemore; not that I would recommend the keeping of bulls without regular daily exercise where there are facilities for letting them have it. The bulls have roots and hay. Usually Mr. Morris has an old stock-sire and a young bull, a junior partner, coming forward to take the old one's place when he goes off, meanwhile useful for heifers. The young bulls bred in the herd are kept in open-sided boxes, or rather fenced-in sheds, with rail-fronts facing a large square yard. Water is laid on to the boxes and sheds, and turned on as required. The gates of the young bulls' sheds are secured by a small, yet sufficiently strong iron-fastener, so simple in its constructi
and use as to minimise the loss of time in opening and shutti

as the herdsman goes about among the animals. This may seem a trifle to introduce, but unless we find economy of time and labour in *minutiæ*, we shall surely find much waste of them in the entire management of a farm or a herd; and that saving or waste may just make the difference between profitable and unprofitable practice.

Within the last 100 years the county of Gloucester has frequently changed its stock. The old Gloucestershire breed, with white backs, gave place to the Longhorn, the Hereford for working and grazing, and mixed breeds for the pail; these were superseded by the Shorthorn. The county owns the names of some of the most eminent Shorthorn breeders, and at the present time is strong in long-established herds of high reputation. These I need not here mention severally. Any one of them might afford interesting matter relative to my present subject: but within the limits of a paper like this it is impossible to do more than take a few illustrations of different kinds of management. Having noticed the system pursued at Maisemore Court as an example, like Mr. Richard Stratton's system in Monmouthshire, of Shorthorn management in the course of plain farming, I propose to glance at two well-known "show herds," that is to say, herds constantly and successfully represented at the leading agricultural Shows, kept under very different local circumstances, and consequently affording contrasts with regard to treatment. I will first ask the reader to accompany me in fancy from Maisemore, through the city of Gloucester, to Prinknash Park, only about half-a-dozen miles from the one place to the other, and then to extend his imagination down the Vale of Severn to Berkeley Castle.

Prinknash Park, the property of Mr. B. St. John Ackers, stands high on the hills between Gloucester and Stroud, is approached by a steep ascent, and looks down upon a most richly wooded landscape, from a position of rare advantage as regards the picturesque, but, to the cold eye of the purely agricultural observer, not so highly favoured. The winters at that height come down with much greater severity, and the very hilly character of the land increases the risk of keeping heavy cattle.

Mr. Ackers finds that in most cases it is best to hand-milk the cows and pail-feed the calves. To this system, however, he admits occasional exceptions; but the cows which suckle their alves do not usually breed again so rapidly as the hand-milked ows, which are milked twice a-day, morning and evening. Some of the cows are good milkers, others yielding only about nough to maintain their calves. Before and after calving, the ws have medicine, to keep the system in a cool and healthy state, but beyond this there is little meddling with Nature's powers.

The calves are reared hardily, lying indoors the first winter, afterwards out in the fields, without a shed for shelter, only good thick hedges, the natural defence of the hill, well wooded, and their own thick coats of hair, to screen them from the storm; while on the ground the snow often lies to the depth of eight or ten inches.

The heifer-calves intended for show are, of course, generously reared, and comfortably housed as they grow older, while those not meant for exhibition are "roughing it" in wind, rain, or snow, behind the hedges. The most valuable animals in the herd, belonging to families not obtainable without large outlay of money, are never put in training for show, but always brought up in the hardy manner described. The show animals may breed, and some of those most successfully exhibited have bred with remarkable regularity; but the training for exhibition unquestionably endangers the reproductive powers, and Mr. Ackers is too well aware of the importance of robust and healthy constitutions to subject to any weakening process the animals upon which mainly he relies for the maintenance of a first-rate herd. The heifers, generally, are kept in a fairly liberal way as regards their food; some have been rather underkept, but the rule is to stimulate growth of frame and development of flesh (not of soft fat which sometimes puts in an appearance for flesh), by such treatment as will bring the heifers forward without a check. Forcing and stunting are extremes equally to be avoided. Much the same rule applies to the young bulls as to the heifers, subject to variation of detail. The bull-calves have sufficient milk and dry food to maintain their growth and keep them in nice even flesh, so that as yearlings they are fit for use, either at home or elsewhere; and there are not afterwards those back-reckonings with Nature which must be met sooner or later where forced growth has laid an excessive tax upon her powers. As a precaution against quarter-evil, the calves are setoned.

The theory of the management of Lord Fitzhardinge's herd at Berkeley Castle is that Nature has given a constitution which wants support; and the practice therefore is to keep liberally, never to allow growing animals (as we should say of growing plants) to flag, but to endeavour to keep them strong, healthy, robust, with plenty of mellow flesh all the time of their growth. The land lies on clay, a stiffish clay, in the valley of the Severn, and is mainly alluvial deposit. Being generally flat and not much above the level of the river, it is unsuited for winter pasturage; heavy cows would tread it all to mud and injure themselves in doing so; but for the summer months it is good land for Shorthorns, quite able to assist their innate tendency to form flesh. The entire area is about 160 acres, of which 30 are arable, always under crop, wheat and roots alternately as the rule. The cattle number from 90 to 100 head, pedigree Shorthorns and dairy and fattening stock, all told. The pure-bred herd numbered 40 at the date of the private catalogue printed in July 1879, but there has been considerable increase by birth since that time, and no public sale since March 1879. Taking its average number, we may fairly consider it as comprising from 40 to 50 head, nearly or about one-half the stock of cattle on the land. The remainder are ordinary dairy cows and stock for feeding off. No sheep are kept, but about 100 Berkshire pigs, from which produce to about 400*l.* value is annually sold. For the work of the estate there are 6 or 7 cart-horses; and now I come to that which gives Berkeley Castle such pleasant associations in the mind of every sportsman—the hunting establishment. About 50 hunters and the famous pack of fox-hounds help to use up the produce of the land; the horses directly, in the shape of hay and straw; the dogs at second-hand, when it is transformed into milk; and the Castle is of course supplied with milk and dairy produce from the farm. Besides this consumption, cheese is made, and a surplus of the value of about 120*l.* a-year sold. It is of the best quality of Cheddar, and realised last year 74*s.* per cwt. With regard to the hunters, it should be explained that the farm does not always supply the whole of their hay. Occasionally an extra rick is bought, and of this, as of the home-grown hay, the horses get the best, the Shorthorns coming in for the outsides and tops of the ricks.

When I last saw the Berkeley herd, in the early part of June this year, the cattle had just passed through a very bad season—no roots, and no nourishment in the hay, and an unusually backward spring had so delayed the growth of grass that they had not begun to show the benefit they otherwise would have derived from going out to pasture. Mr. James Peter, the able and successful manager, had certainly got the animals in very good blooming condition, but he owned that it had been done by the free use of dry food, especially of crushed oats, of which he thinks most highly as a safe food, one that never destroys the breeding powers. In average seasons the usual keep would have ensured equally good condition. He had given during the disastrous seasons of last year about 3 lbs. of cake each to the grown animals. This he does not usually give to cows, except to those which calve about January or February, and they have a little to keep up the flow of milk until they go out to grass. Mr. Peter has not adopted any cooking process for bad hay, but approves of the practice of those who do so use it. For his own purposes he merely cuts it into chaff.

In the Berkeley district calves running out are often troubled with "husk" or "hoose." The system of rearing in the Berkeley Castle herd is to let the cows suckle their calves, the calves running with the dams and sucking at will for three weeks, and the cows being milked between 5 and 6 in the morning, and at 4 o'clock in the afternoon, to take from them whatever the calves may have left. At the end of the three weeks the calves are taken away and brought up by hand, the finger given for a day or two, if necessary, to teach them to drink out of the bucket. They are fed twice a-day, about one gallon at a meal, less if they scour upon that quantity. In this respect, as should be the case with all allowances to cattle, the constitution and appetite of the animal are studied. Sometimes a calf of three weeks old cannot beneficially take more than two quarts at each end of the day. The calves never get much more than their one gallon at a feeding. Hair-balls, the frequent cause of loss in some herds, are seldom known at Berkeley. At about five weeks old, calves will nibble at something in the manger. They then have crushed oats, Indian-meal and barley-meal, ground, but not too fine, as calves do not so readily chew the cud when fed on fine-ground meal. These different kinds of meal are varied, and are given in cut hay. Milk is given to the calves until they are six or seven months old. This treatment applies to the bulk of the young stock, reared in the ordinary way. No rule can be laid down for the show animals. Each is the subject of special study. The experiment of suckling for five or six months was fairly tried, but invariably great difficulty was found in getting the cows to breed again. Either they did not show any sign for breeding, or, if they did, and were supposed to be safe in-calf, they would turn again as soon as the calf was weaned.

The pedigree cows, for the greater part, are good or fair milkers. The dairy cows without pedigree are all Shorthorns, and, for ordinary cows, are of a superior class, bought in at 24*l.* or 25*l.* each. They and the more highly bred cows form in fact one Shorthorn dairy herd. The dairy appointments are excellent. It is scarcely needful to say that the surplus offspring of the pedigree cows, when the herd grows too large for the farm, have been sold at high averages by auction. Some of the bull-calves also go to farmers in the district at remunerative prices. The ordinary dairy cows' calves are sold at 50*s.* to 60*s.* (the heifer-calves to be reared for dairy stock), and the cows, milked through the summer, are put up about October, tied by the neck in byres, fed on hay, roots, cotton-cake and Indian-meal, and sold off fat at Christmas for about 27*l.* each. Say the cow in-calf costs in the early part of the year 24*l.*, her calf sells for 2*l.* 10*s.*, and she brings 27*l.* at Christmas, there is an excess of 5*l.* 10*s.* for cow and calf over the cost price of the cow, and one season's milk to cover the grass keep and final feeding for the butcher. Any cows that prove extraordinary milkers are put to one of the pedigree bulls and kept over for future dairy purposes. The calves from such cows are excellent examples of what may be done by the use of superior bulls, and the results are still more marked after a second or third cross. The high-bred sire gives a greatly enhanced tendency to growth of frame and flesh, and perhaps there is in Shorthorns bred up for two or three generations from such sires out of good, strong, country cows, a proportion of lean flesh to the fat which it is not always easy to obtain in the unmixed descendants of high-bred cattle; that is, of cattle carefully nurtured, and too often overfed, through many generations. Under judicious treatment, doubtless, the older families of Shorthorns can probably hold their ground as beef-makers against their offspring from common country cows; but we must not forget their right place, which is not so much to be themselves butchers' beasts, as to have the greatest possible power to improve, by their bulls, the common stock of the country, or other breeds which have lean flesh, but want the mellowness and early maturity of the Shorthorn.

The cotton-cake above referred to is given partly for its feeding properties and partly to counteract the too laxative effect of the hay and roots, which in that district are very good and have rather the tendency intimated.

The cows, as I have said, cannot go out in winter on account of the soaky condition of the low-lying land. There are plenty of well-ventilated buildings, and they have an ample supply of water in the house; and they lie in, night and day, from the early part of December (earlier or later, according to the weather) until the 1st of May, or, in an early spring, the middle of April. They are never turned out until there is a good "bite" of grass.

In Somersetshire there is a herd very well known in the Show-yard, yet presenting many points of difference, and even of contrast, when compared with either of the show herds in Gloucestershire, which I have noticed for special features of management. I allude to that of Mr. J. S. Bult, of Dodhill House, Kingston, near Taunton, a breeder of very long experience and successful practice, who founded his herd originally upon the stock of the Rev. Henry Berry, has turned out at various times many noted prize animals, and enjoys a reputation so extensive that it has led to an occasional foreign trade and the export of a considerable number of his cattle. His steers, more particularly, are famous for their weight and quality. The general herd is kept in very ordinary breeding condition, and it is noteworthy that the dams of those mountains of beef which astonish visitors to the Smithfield Club or Bingley Hall Shows are cows that fill the milk-pail. Mr. Bult farms about 200 acres, in the flat vale of some fourteen miles width, between the Quantock and Blackdown Hills. About one-third of his land is arable, and 30 acres are in orchard. He took the first and champion prizes last year at the Kilburn International Show for orchard-produce. The herd numbers about forty (or two or three over); and although there is no standing flock of sheep upon the farm, from one to two hundred ewes are bought in annually to breed fat lambs, and are in turn sold to the butcher, and followed by other sheep for feeding off turnips and rape. Some black pigs are kept, one job horse, and four carthorses for the agricultural work.

Mr. Bult's calves are weaned at a fortnight old, and fed by pail and finger, on new milk, until they are three weeks old; then the quantity of the new is lessened and skim-milk added, with linseed-gruel in part compensation to the calf for the loss of cream; and by degrees the proportion of new milk is made less, and of skim-milk and linseed more, until the two latter, with a few roots in winter, with a little barley-meal and linseed-cake, and as much hay as they will eat, form the diet of the calves, and eventually, of course, the liquid is discontinued, and the young stock have the solid food and water only. No common farm stock could live more plainly. After calfhood, they run out for their living. Those, however, for show, are differently treated; they are housed, and each, according to its capacity, has cake and meal, principally oilcake and barley-meal mixed. The heifers (those under ordinary treatment) bring their first calves when from two-and-a-half to three years old. The aim is to have the calves chiefly in December, but sometimes an unfavourable season will throw the cows out of course, as is the case at present, and the calves come at irregular and less convenient times. The cows lie out at nights from as early in May as the weather will permit to the end of October. Mr. Bult does not care to keep them out late in the autumn if the quantity and quality of his hay, and other considerations, admit of bringing indoors tolerably early. They do better under cover when the nights become chill and frosty.

The cow at calving has bran mashes, 2 oz. of nitre in a bucket of water with the chill off, and her own first milk. While suckling, that is, during the first fortnight, she is milked (not at the time the calf is actually sucking), to clear her udder of the surplus; and after the calf is weaned, the cow is regularly milked twice a-day.

The bulls are kept up and led out for exercise; but Mr. Bult is in this respect, like other practical men, unable to always act up to knowledge. He would, if it were possible, have them taken out oftener, longer, and more regularly than at present. The pressure of other farm work upon an ample staff of servants often forbids the doing of things which it is wise to do. So with the bulls. When time is plentiful, they get their exercise; when work superabounds and time scarcely suffices, more absolutely necessary matters take precedence.

NORFOLK.

The management of the herd at West Dereham Abbey, in the county of Norfolk, is not only the best I can select in connection with the agriculture of the district, but it has a more than local character: indeed, if we take a broad view of English systems in general, we find Mr. Hugh Aylmer's standing out from among them with marked distinctness, in some respects differing from all others with which I am acquainted. Mr. Aylmer succeeded his father in the possession of a flock of longwool sheep, now familarly known as the West Dereham Longwools. In order to make clear the position that the Shorthorns occupy at West Dereham, it is necessary to glance at the farms generally, and the flock in particular. At the Abbey Farm, the Manor Farm, the White House Farm, Sheep's Hill (a grazing ground of 60 acres in Wereham Parish), and a fen farm adjoining his higher land (useful as a reformatory for cows persistently disposed to grow too fat), Mr. Aylmer has altogether 1399 acres (his own property, besides some which he lets off), divisible into 360 acres of permanent grass and 1039 under the plough. The four-course system is followed; steam cultivation in the autumn; and about twelve working Devons are kept to plough the fen land. The farms adjoin one another, in fact may be called one farm, rather more than three miles from end to end; and Mr. Aylmer's residence occupies a conveniently central situation.

The average rainfall of the district in ordinary years is about 23 inches. The country is generally low-lying, without hills of any considerable height, but gently undulating, unlike the dead level of the neighbouring fens, and has the attraction of wood, including fine hedge-row trees, and the advantage of well-kept roads.

The produce of the arable land, it should be understood, does not go to the Shorthorns, except that they get sown-grass hay, and sometimes, in winter, cut straw with malt combs; and on the other hand the horses share with them the permanent pasture. The calculation is 1½ cow to the acre in summer. Sheep are thick on the ground. The flock numbers on an average about 1500, but this number of course varies. In the spring the number is increased by about 600 lambs; then when the annual ram-letting comes, about 180 are publicly disposed of the first day, and there is a good deal of private business besides; there is also a continuous private trade, and sheep are exported to almost every part of the world. Thus the births, sales, lettings, and return of rams from hire, make an ever-fluctuating number. The herd of Shorthorns, established about thirty years ago, and numbering at the time of my last visit, in the early summer of this year, between 90 and 100 animals (about 80 females and 15 bulls), is treated much the same as the flock, that is to say, as a part of the produce of the farm which must make rent and profit. The principal return from the Shorthorns is derived from the sale of bulls, for which there is large foreign and colonial as well as British demand, and occasionally by the sale of surplus females. In order to keep up the demand for West Dereham bulls, for home or exportation, it is necessary, as also with the sheep, to make the personal properties of the animals the great aim in breeding. By long experience Mr. Aylmer is made fully aware of the importance of having the best blood; and by the same experience he is also taught that without discrimination in its use the best blood may soon yield but poor results; the ground laboriously gained by selection may easily be lost by *neglect* of selection; and the inherited impetus towards improvement, given by careful cultivation, may be destroyed by bad management. The main desiderata are—beef and its economical production; constitution—healthy, hardy, and robust; early maturity; and milk, abundant and rich. Beef, and the frame for beef, take precedence of milk, but milk is accounted a very desirable and a very possible accompaniment of the largest inclination to make beef, and of the frame best fitted to carry beef. Good hair and skin must be included; indeed they really are included in the quality of hardiness, for a sleek, thin-skinned cow, short and poor in hair, can never be a hardy cow; and the West Dereham cattle, in fact, have thick, mossy, close-set hair during the winter months. I desire to set forth these facts at the outset, not that the properties described are peculiar to West Dereham, but in order to show the bearing of the management, as it is specially designed to maintain the properties to which I refer.

The calf at birth is allowed to remain with the dam, at least in the same box; but there is in the corner a little pen for the calf, in which it is kept, having the mother's companionship, though not unrestricted access to her, for the first fortnight. From that time the calf has a pen in some other house, sometimes in a box to itself, but oftener a compartment in a house with other calves, and is taken to the mother twice in the day, morning and evening. If the mother is a deep milker, the herdsman takes from her as much milk as he finds she can spare, leaving plenty for the calf, which then comes in and clears the udder, so that the calf gets the richer "strippings," but does not satiate itself by taking too much after a day's (or a night's) fasting. Some cows give a considerable quantity of milk at each end of the day, besides keeping their calves well; others only rear their calves. One cow, Mr. Aylmer assured me, yields when in full milk two gallons (eight imperial quarts) morning and evening, *i.e.* sixteen quarts in the day, before suckling her calf, which is always fat when weaned. There is no inflexible rule, but usually the calf, if a heifer, is suckled about six months; if a bull, sometimes rather longer. As soon as the calf can be enticed to eat a little dry food, it has in its manger a mixture of crushed oats, oilcake, and ground maize (these ingredients varied in proportion, and one or more omitted, so as to tempt the appetite), and sometimes a little cut cabbage or tares with the dry food; but it does not do much more than flirt with the manger until it reaches the age of six or seven weeks, when it begins to eat in earnest, and by the time it should be weaned it is pretty well past the necessity of having milk, so that there is no checking of growth or loss of flesh after weaning. The quantity of milk, too, can be regulated by the quantity taken from the cow before the calf is turned in with her, and the calf is thus by easy transition relieved of dependence upon its mother. Indeed some calves, particularly bulls, are gradually reduced to so small a proportion of nourishment from the dam, that they grow and thrive faster after they are weaned. For a calf a little out of order in health, or not thriving quite so well as it might do, a raw egg, occasionally, beaten up, shell and all, is found a wholesome addition to its diet. I have seen this used elsewhere, and have myself used it for calves (omitting the shell) with very good effect. The weaned calves and all the stock indoors have water plentifully supplied, but not laid on before them in their boxes. It is laid on to tubs in the yard, and thence drawn and carried to the animals as required.

Formerly Mr. Aylmer had all his cows hand-milked and the calves brought up by bucket, and the system answered very well. It was changed to the suckling system, not from any faults in the hand-milking and pail-feeding system itself, but on account of the difficulty of finding men who are equally good milkers.

One man would keep the cows up to their milk to any extent, while another in a very short time would contrive to dry all the cows he milked. Mr. Aylmer prefers to have one regular plan and not a mixture of various ways, so when he found the drawbacks to his first system, he changed entirely to the second, and has retained it ever since.

No difficulty in getting the cows that suckle their calves to breed regularly is found at West Dereham Abbey. The reason why so many breeders do meet with this difficulty is supposed to exist in the continued companionship of cow and calf. If the calf is allowed to run out with the cow, or to lie in with her, the cow, as a rule (a rule, however, by no means without exception), is said to be longer in coming to profit again, in fact shows no disposition to be fruitful, until the calf is taken away; whereas if the cow sees her calf only morning and evening, just long enough to feed it, she is virtually in much the same circumstances as a hand-milked cow that never sees her calf, and she will breed again quite as soon as if milked only by hand. The great point, Mr. Aylmer insists, in favour of reproductiveness in the case of the female is *never to let her get too fat.* If once she is allowed to reach the condition of obesity, there is no dependence to be placed upon her as a breeder. Reducing in condition may bring her back to her duty, but it is a tiresome and risky process, and very uncertain in its results. The rule that prevention is better than cure applies with great force to this part of Shorthorn management. If one of the West Dereham cows is observed to be making fat too rapidly, a few weeks' banishment to the purgatorial fen farm is the precaution taken; and in the event of a cow obstinately growing fat to the destruction of her reproductive powers, she is handed over to the butcher, for whose offices she has prepared herself. Idlers are not permitted to remain in the herd.

In the treatment of calves, exercise is a matter of the first importance for health, and to keep the limbs straight. It also has the advantage of promoting docility, by making the calves accustomed to the company of the herdsman, and to handling, and trains them to step out smartly when required for inspection. The calves, therefore, are regularly either led out in a halter every day, or turned out to stretch their limbs and take their airing in the straw-yard.

No particular season of the year is made the calving-time: it is all the year round, and if the ages of bulls do not happen to suit the home buyer, they may do for the colonist or the foreigner. The calves are turned out to grass at six months old, or as near that age as possible, according to the time of their birth. The calves born late in the year, or early in the new year, go out in the summer following. Those born in the spring, summer, or early autumn have not age enough for going out the same year, but stay indoors (with their daily allowance of exercise as stated) over the first winter. All calves, male or female, are setoned in the dewlap in the spring. The heifers are allowed to breed as soon as they will after they are fifteen months old, bringing their first calves at a little over two years old. If delayed beyond this age, they are found to be not so ready to breed, and sometimes altogether fail, from their hereditary tendency to fatten. It is not so easy to keep them down in condition as to make them fat.

The cattle are separated and assorted in ages, for the sake of appearance. In one field, or yard, or range of sheds, according to the time of the year, will be found the large heifer-calves; in another the yearlings; elsewhere the two-year-old heifers, and so forth, up to the ponderous old dams of the herd, often showing large, square, distended udders. For one week before calving the cows are kept indoors, their only food being long hay and bran.

The housing is exceedingly good, and so arranged as to work in with the system of training animals to a hardy life, without that reckless and needless exposure, injurious to health and extravagantly wasteful of both the animal and its food, which some stock-owners call "making cattle hardy." The younger heifers have open-sided boxes, a yard with sheds, or boxes with a separate yard to each. Most of the cows are housed in boxes round the yards, and nearly all lie separately, so as not to knock each other about. The whole of the stock lie indoors at night in winter, the district being too wet for even the heifers to lie out. Usually from about the end of April to the end of October or beginning of November (depending upon the season) the cows lie out at night. During the summer months they get grass only; in winter, long hay if hay happens to be plentiful; if not, cut hay and straw mixed. They have no roots, but go out to grass every day in winter. If the ground is clear of snow they thus get a little picking of grass; while the snow lies, they have no green food, yet the air and exercise keep them in health, and they can help themselves to water *ad libitum*. In noticing the treatment of Shorthorns in Aberdeenshire, I have referred to a prevailing impression that there is some connection between an abundant crop of turnips together with a short crop of straw, and calf-casting. Mr. Aylmer's opinion is confirmatory of the belief that too large a proportion of turnips has a tendency to cause abortion, and, as we have seen, his cows have no roots at all; while, as a sheep-breeder, he most positively maintains that so great is the danger of giving turnips to ewes during pregnancy, that he never allows his in-lamb ewes to have any. *Per* *contra*, however, I must refer to the very common practice of letting the ewes for lambing take their place on the turnips with the rest of the flock, and the absence of abortion (except from ordinary casualties) in countless places where this is customary. The very day I last left West Dereham Abbey I went into the heart of the arable district between Cambridge and Newmarket, and there, as elsewhere, the breeding ewes have turnips regularly, and no such idea as that the ordinary use of turnips endangers the fœtus is entertained by the principal flockmasters. Frosted turnips, no doubt, are injurious to cattle; and such an over-proportion of turnips as will cause an undue distension of the rumen must necessarily be dangerous during pregnancy.

All the boxes for the cattle are well drained, and in those places which are not open-sided sheds, or with mere railing to keep the animals in, great attention is paid to the admission of plenty of air and light. The calves' mangers are high at the back and low in front, sectionally hot-house shaped, divided into three or sometimes four compartments, and placed back up to the gangways, so that they are easily replenished with food as the herdsman passes. To admit of this being done the more readily, the side of the box which forms the back of the manger is of convenient height to reach over from the outside; and to prevent accident, a curved iron bar goes from the wall over the manger from one end, into the side of the box at the other end, and it is just high enough above the manger to allow the calf to feed, and not so high as to permit it to get its fore-legs into the manger and so make a step up for a leap over into the gangway. Wheat-straw is preferred to barley-straw for bedding. In some places, where the cows lie chiefly in byres, I have found the contrary, wheat-straw being unquestionably the right bedding for horses, but barley-straw considered better for cows, because softer and more easily and evenly spread in the stall. The objection to it is a belief entertained that it harbours parasites.

The bulls (as a rule, which may have exceptions in the case of restless bulls, in the habit of pounding the walls and doors with their heads) are kept loose in their boxes and led out for exercise. Each bull has about half-a-bushel of roots in the day, and long hay in the winter, cut cabbages and tares, instead of hay, in the summer, until the mangolds come. The daily allowance of oilcake is about 1 lb.; an aged bull in service will probably have 2 lbs. in winter, none in summer.

IRELAND.

After seeing in succession the English and Scotch herds, I crossed to Ireland to compare the systems of management already noted with those practised in some parts of the south of Ireland. The line from Waterford in the south-east to Tralee in the south-west passes within easy distances from the properties of Mr. Gumbleton of Glanatore, on the borders of the counties of Waterford and Cork, Mr. Downing of Ashfield, and Mr. Welsted of Ballywater, in the latter county; and near Tralee is Ardfert Abbey, the seat of Mr. Crosbie, in the county Kerry. All these are homes of very well-known Shorthorn herds. Mr. Gumbleton has been for some years a successful exhibitor at the leading shows in Ireland, and has taken the honours also of the Royal Agricultural Society of England and the Bath and West of England Society. There are scarcely, however, in the management of the Glanatore herd any special details to bring into very prominent notice. The cows, generally, are in healthy breeding condition, not overfed; some, indeed, decidedly poor; and even those which had been exhibited, by no means too fat for breeding. They were out at grass with the rest. The calves, I thought, might be better kept, with advantage. They were all in low condition.

I am not advocating the *forcing* of young stock intended for breeding. If it is necessary to force cattle for exhibition, let the forced animals be sacrifices, to demonstrate the capabilities of their kindred. Surely one may question the wisdom of using too freely the actual descendants of animals fed to gross obesity, if it is desirable to keep up the constitution of the Shorthorn, and a fair proportion of lean flesh to the fat. Artificially produced characteristics become hereditary; and for this very reason I would advocate the liberal rearing of calves. Cattle reared in poverty for several generations degenerate to the unimproved type. There is the skin, and if you put your hand upon it you are uncomfortably conscious of the nearness of the bones. Cattle, on the other hand, in each successive generation "overwhelmed with prosperity" from their birth, have the skin lined only by that which would melt away before the fire.

Mr. Gumbleton's views on Shorthorn management are so forcibly expressed in the Preface to his printed private Catalogue of 1878, and there is so much in his remarks worth considering, that a passage or two may be usefully extracted. His great object, he explains, was to find out whether valuable Shorthorns, if treated as ordinary cattle, would prove their superiority. "Was this breeding a rich man's fancy, or would "it pay the tenant-farmer? Glanatore is, for the greater part, poor, light land, at a considerable elevation; the cows get no artificial feeding (corn and cake) after they are one year old. Though they do not look so blooming as might please some people's taste, it is found they breed regularly, are very healthy; and, when beef is required, a few months' feeding makes them fit for the butcher. Doubtless, a herd kept in high condition will look splendid, as meat will hide numerous faults, but costs a fortune, for no use except to please the eye." In conclusion, Mr. Gumbleton maintains that the results of his experiment have proved "that good blood is of money-value; that there is no occasion to spend a fortune in keeping a herd in showyard condition, even to win high showyard honours; and that in whatever position a well-bred Shorthorn is placed, she will hold a higher place than any ordinary cow."

Next to Glanatore, in order of distance westward, is Ashfield, about a mile from the town of Fermoy, pleasantly situated in the Blackwater valley. Mr. Downing's herd, although not what is called a show herd, has sent out animals distinguished at the leading shows of the three countries. The peculiarity in the treatment of his calves is that while the heifer-calves are suckled for six or seven months, the bull-calves are reared by the pail. The heifer-calves are turned out to their dams twice a-day, or in favourable weather allowed to run with them in the pasture. Some of the cows being very good milkers, and having much more than the calf could take, are milked while the calf sucks, that being, as remarked before, the time at which the cow most readily yields her milk to the hand. At about a month old, when the calves, male and female, begin to taste anything put in the manger, they are supplied with a little dry food—cake and finely-crushed maize and oats. As they grow older, and the winter season comes on, they and the cows all have pulped roots, cut straw or hay (sometimes mixed), and crushed oats, with Indian-meal or malt-combs. When the soft turnips and swedes are finished and mangolds take their place, it is found that malt-combs are usefully corrective of the purgative effect of mangolds. The cows not suckling their calves are milked twice a-day. In winter the yearling heifers stay indoors, but the cows, kept in boxes, are turned out every fine day for exercise and to graze. During the summer season, of course, they go out to grass. The whole herd is in nice even condition; nothing gross or overfed. The bulls have bran and crushed oats, with hay in winter and cut green food—vetches and clover and rye-grass—during the season. The principal stock-bull (the one at present in service, a well-known show bull formerly, but now a hale and an active animal of nearly nine years) goes out every day with the cows. The Ashfield estate lies between two rivers, yet, except for those who are fortunate enough to have their land on one or other of the rivers, water is scarce. Mr. Downing has, however, the advantage of the solitary spring found between the rivers, and from this he has enlarged an excellent watering-place, invaluable to him for his herd.

Ballywater, near Castletownroche, lies about three miles to the north, or right of the line of railway, as the route already specified is continued. Mr. Welsted's herd was founded more than thirty years ago, and retains direct descendants of some of the animals originally purchased. For many years specimens of his cattle were successfully exhibited; but the practice of showing has been long discontinued, and the whole herd is now kept in very moderate breeding condition. For the last eighteen years the young bulls, any surplus heifers from the old pedigree families, and sometimes a few heifers bred up from good, useful stock, imported from England, crossed with the pedigree bulls, have been sold annually by auction. The object, therefore, is to make the herd increase as much as possible, while keeping it up to a standard of breeding and of excellence high enough for practical purposes, to insure a demand for the produce. For upwards of twenty years the bulls used as sires have been hired from England. The calves are suckled until about twenty-four hours old, but are not left with their dams. They are then hand-fed, a moderate quantity of new milk being given, and this is gradually reduced as they take other food. They have then grass in the day and hay and roots at night, the roots are cut into finger-slices, and each calf has about a handful of crushed, roughly-ground, or bruised—never fine-ground—oats, thrown over the sliced roots. There are occasional exceptions to the hand-rearing system. Late calves, for instance, are often suckled, and there are sometimes other circumstances in which it is found best to let the cow rear her calf; but, as a rule, where reasons for the contrary do not exist, the cow after the first full day is hand-milked, and the calf fed from the pail; afterwards from the rack and manger, until of age to go out to grass. The heifers often lie out during the second winter, and the programme for the rest of their time is plain and hardy living, with constant discharge of the duties of motherhood, or the butcher's poleaxe. Fertility, like dairy and grazing properties, may be promoted by judicious management; but the importance of selection, as a part of management, should never be overlooked. Here, again, we are on border-land. The subjects of breeding and management are so joined together, that it is impossible to traverse either without entering upon the confines of the other.

Mr. W. Talbot Crosbie's herd at Ardfert Abbey, county Kerry, was founded in the year 1841. For the last twenty-eight years the young bulls have been sold by annual auction, and females have been sold privately or by auction, whenever the herd has out-grown the accommodation of the land and buildings. The aim has been to produce bulls, and cows for breeding bulls, of a high class; and in the management, therefore, the beef-making and dairy properties of the Shorthorn have been kept in view, not for immediate profit from the sale of fat cattle, or of milk and butter, but in order to make the living produce of the herd valuable to stockowners, who seek profit from those sources. The herd has been successfully represented in the showyard; and although Mr. Crosbie has ceased to exhibit, cattle bred by him, the offspring of bulls from Aldfert are still constantly winners at some of the principal shows. The averages of his sales of bulls have risen considerably within the last few years, and at each of the three last sales, during the great period of agricultural depression, averages of from 50*l.* to over 53*l.* have been realised. The readiness to make beef is the first object. Milk, although secondary, is considered of great importance. Some of the cows are capital milkers, the majority fairly good milkers, considering their wealth of flesh; and Mr. Crosbie never had a cow that could not rear her own calf, except in one or two cases, when all the quarters of the udder have been lost from inflammation, commonly called "garget." Most of the cows, besides rearing their calves, have a good surplus for the house: but of this more by-and-by.

The Ardfert estate lies chiefly on the Limestone and Carboniferous Limestone; not much above the sea, the country being nearly level from Tralee (Tra-Lee, by interpretation, Strand-of-the-Lee), about six miles distant. The land is a good alluvial soil, and the temperature equal, snow seldom lying twenty-four hours on the ground, and ice strong enough to bear being seldom seen. I am unable to give the statistics of the rainfall at Ardfert; but it is not so great as at Tralee. Wheat grows splendidly. Altogether about 300 acres of pasture are in hand: but a sheep-walk of 40 acres must be deducted, leaving about 260 acres of excellent grass-land and 136 of arable, for the general stock of the farm. The buildings, including hay- and corn-barns, the latter built of concrete, with a special feature in the concrete roofs, are most conveniently arranged, so that the men distributing the food and bedding to the cattle work from a centre, where the turnips, and the straw-, hay- and sheaf-lofts are placed. A travelling truck on rails expedites the men's labour, and all is under cover, an important matter in a wet climate. In the main building are the young bulls for the yearly auction (after they are taken from their dams), and any other young stock that may need extra keep, and in the wings are the bre stock. Old and young are kept almost entirely in boxes. Th is tying-up room for only 14 head; but box-accommodation i

122, so that the buildings can cover 136. The boxes have ventilation at the top, and "day-doors" or gates to admit a plentiful supply of air during the warmer hours; solid doors to close at night, if the weather should be cold enough to make the animals need that protection. In the case of the cows and bulk of the young stock, one side of the box is generally open to the weather. With the exception of the yearling heifers and young bulls, sorted in pairs, and the calves in what we may call the nursery, in threes, the animals, although together as regards the food—their boxes adjoining and the truck-line passing down the middle of the buildings—are separate as regards each other; so that when one is removed no excitement is caused among the rest. The boxes are numbered, and the lines of boxes are distinguished by alphabetical letters, for ready reference to the whereabouts of any particular animal. The first calving cow of the season is put in box No. 1, the second in No. 2, and so forth. The steading has a Turkish bath, very successfully used for any animals that happen to take cold. Concrete cisterns contain a plentiful supply of water. Besides the boxes for the Shorthorns, stable room for seven horses is provided.

The herd at the time of my visit, in the middle of June, consisted of 116 pedigree Shorthorns of both sexes and all ages, and, as no special causes of extra increase or diminution existed, this may be taken as about the usual number for the time of year. The service of the cows begins in February, and no cow sees the bull after October. Most of the calves are born in December, or early in January; so that the period between January and the spring sale, about the end of March, would be the time when its number is strongest. The 116 may be divided thus: females, exclusive of sucking calves, 79; heifer-calves, 10; bull-calves, 24; and stock bulls, 3. Usually from 40 to 50 of the cows and heifers calve within the year. The calves are suckled, and all run out with the cows as soon as they are turned out to grass, the heifer-calves, until weaned, remaining with them. The weaning of the heifers takes place when the cows are taken indoors in the autumn; but this additional rule is also observed—that no calf is ever allowed to be with the cow after she is six months in-calf. The bull-calves are brought in as soon as they begin to be troublesome in the field, and are put, in pairs, into their boxes. Much stress is laid upon this system of pairing them, and keeping the same two always together until the sale. The dams are brought in to suckle them twice a-day until the weaning-time. The bulls get other food as soon as they are brought in; the heifers not until taken indoors in the autumn, and very little then. The food of both is pulped turnips, plain hay and a mixture of linseed-cake, decorticated cotton-cake, oats, and bran in the following proportions, divided into four equal parts:—Two of linseed-cake, one of cotton-cake, and one of crushed oats and bran. No hard-and-fast line is observed as to the quantity given to each animal. The bulls get more or less, according to size; the heifers, as we have seen, only a little, as a sort of relish; but the needs of each are carefully watched, and more or less food allowed accordingly. No milk is given to either bulls or heifers after they are weaned. At 5 o'clock every evening and 7 in the morning, women go round among the suckling cows and take any accumulated milk. While the majority of the cows are in full milk and their calves young, from 100 to 200 gallons of milk come into the house in the course of one month. The quantity, of course, diminishes as the calves require more and the cows yield less; but this yield in excess of the calves' sustenance implies the existence of milk-productiveness, which might be largely cultivated by regular and frequent milking (say three times a-day) and restriction of the calves' access to their dams.

The cows, with their calves, and the younger females, are generally turned out, night and day, before the 1st of April. This year, the spring being cold and backward, some were brought in at night until after that time. The autumn weather being usually open and mild, they are not taken in until late in November or early in December.

In the winter the breeding cows get nothing but straw, turnips and water, until they calve, except for about a week before calving, when they get scalded bran. Soon after calving, their warm bran mashes are discontinued, and they have hay, turnips, and bran wetted with cold water. If, as is sometimes the case, a calving cow has become on this ordinary keep very fat, a little linseed-oil is given to her on pulped turnips. As a rule, very little, if any, medicine is given. Regulation of the system by the diet is preferred to physic. No cake is given to breeding cows, but if, as is not usual, a yearling heifer happens to be in-calf, she has, if she seems to need it, a little oil-cake to keep up her strength and condition. In the ordinary way, the heifers live their second winter on straw and turnips. It is noticed, however, at Ardfert (contrary to most English experience) that yearling heifers are shy of breeding, that about one-half of those which have the chance do not prove in-calf, and nearly all the remainder take a year's holiday after the first calf. It is only, indeed, in the case of yearlings that have bred (*i.e.* become mothers when about two years old) that any difficulty as to breeding is found. The suckling cows breed again regularly, as a rule within the year, although those which have heifer-calves are accompanied by their calves night and day.

Generally, the evidence I have collected tells the other way; that cows allowed to have their calves running out with them, or living in the same box with them, do not readily breed again until the calf is weaned; but the particulars gathered from the Ardfert farm-books afford very positive testimony, extending over a long course of years, so far as the Ardfert cattle are concerned. The explanation I cannot attempt to offer, but these are the facts. Taking dates of the produce of ten cows, whose average age at the date of last calving was ten years and one month, I find that their average produce was eight calves each, average at date of first calving two years and ten months, and average length of time between the birth of the first and of the last calf, seven years and three months. These cows are all now in the herd, and, so far as I know, continuing to breed; several of them are by no means old cows, and are likely to breed for many years; while others may in all probability yield each another calf or two. Extending the calculation to cows that had passed out of the herd, I arrived at similar results, but found a greater average of calves, and of age at birth of last calf, because the full life of several of the cows came into the account, which was not the case in taking ten old and middle-aged cows from the herd as it stands. I may further illustrate the breeding power of the herd by taking (from the same source, the Ardfert farm-books) the last few years' records of the number of breeding cows in the herd, and the number of living calves produced by them. The following table includes, in the column for the number of calves, only such as were actually reared beyond what may be called infancy. Losses beyond that period are rare, and the figures show, not only ample reproductiveness in the herd, but also a very small percentage of losses among the calves at or soon after birth. When the number of calves reared is in excess of the number of cows in-calf, the difference (as is obvious) is in consequence of one or more of the cows producing twins. One cow had bred twins four times.

Year.	Cows in-calf.	Calves reared.
1872	49	51
1873	52	40
1874	46	46
1875	38	40
1876	46	48
1877	40	41
1878	41	40
1879	41	41
	353	347

Thus, excepting losses which were compensated by the birth twins, there was a total loss of only six calves in eight years, or of not quite 1 calf out of 44 per annum. The figures for 1880 were not completed when I took these memoranda; but so far as the calves were born (and all immediately entered in the books) the figures appeared to be about the average of the preceding eight years.

CONCLUSION.

In reviewing the various systems of management in different districts and circumstances, one cannot fail to remark the occasionally contradictory character of the evidence presented concerning matters of fact. In one herd, the early breeding of heifers is considered inimical to their strength and growth, and even affects unfavourably, at least for a time, their breeding powers; in another herd, heifers will be shy to breed, or will not breed at all, unless they are brought to service early. In one herd, cows do not breed again until their calves are weaned; in another, the suckling of her calf does not throw the cow one day later. With regard to this question, the weight of evidence appears to be in favour of the suggestion that it is rather the companionship of the calf, than the fact that the cow is milked by it instead of by the hand, that delays the cow's breeding; but on the other hand there is—for instance, at Ardfert (where all the events in the herd are minutely recorded, and accurate statistics are accordingly afforded by the books)—the fact of cows breeding regularly within the year, while those which have heifer-calves are never parted from them until the final weaning, when the calf is seven, eight, or nine months old, and those which produce males do not lose their society until the young bulls become troublesome, and this can scarcely be before they are at least three or four months old, when in most cases the dam is again safe in-calf. To the obvious answer that delay occurs because the cow is not sufficiently watched, and that while the calf is with her she needs closer watching than if it were away, one may draw argument for a rejoinder from the example of Holker, where the utmost vigilance is exercised, and yet the cows that suckle their calves do not readily breed again. The explanation of these contradictions is perhaps not very easily to be found; but I would submit that we must seek it in local conditions. Perhaps there are in the climate or the land at Ardfert, or in some circumstances of the breeding, conditions which do not exist at Holker, favourable to the reproductiveness of nursing-mothers. A friend writing from the north of Ireland, without reference to my present inquiries, in fact, some time before I had any idea of writing upon this subject in the 'Journal,' mentioned that the soil or climate of his particular district appeared to be peculiarly favourable to the fertility of cattle, for there was very seldom the least trouble in getting animals to breed. Writing a few months later, the same correspondent said that the season of last year had been exceptionally bad in that respect, an unusually large number of cows having returned to the bull. The remarks in both letters applied not only to the Shorthorns, but to the common stock of the country. That air and pasture have much to do with this is notorious, and a change will often do that which no amount of management in one place can effect. The late Mr. S. E. Bolden's success, especially his extraordinary good fortune in raising a family from old Duchess 51st—a speculative purchase at a risk-price—and numerous offspring from some old Warlaby cows bought as doubtful breeders, was attributed in great measure to the facility he had for changing his cows about between Springfield Hall and his sea-side farm of Red Bank. I cannot dismiss the impression, I will not say conclusion, although it almost amounts to belief, that there is in the air of Ardfert, which is near the coast, and probably in the richness of the grass-land, something to account for the apparently exceptional readiness of the suckling cows, whose calves actually live with them, to breed again. My own experience of the suckling *versus* the hand-milking system is, like that of Mr. Drewry at Holker, Messrs. Gaitskell at Hall Santon, and many others, strongly in favour of the latter as regards the readiness of cows to breed again; yet the land upon which the Shorthorns at Lune Bank were kept is some of the richest grass-land in the North of England. With regard to the early breeding of heifers, on the same land, the safest plan by far was always to let them breed early. If they were not in-calf before they were two years old, I generally had trouble with them. From fifteen to twenty months, according to size and strength, was the usual time for beginning; and I did not find that heifers which were mothers at two years of age were in any way injured, in either early or after life. There was another point, besides. Cattle of a heavy, flesh-making sort, on good grazing land, could not be got to milk unless they bred early. When they brought their first calves at two or two-and-a-half years old, they seldom failed as milkers; and they were at any time ready enough to make flesh when required, often when not required to do so.

But in addition to contradictory evidence on matters of fact, we have to deal with contradictory opinions upon questions of expediency. For instance, the dry food for young stock—should the corn be merely crushed or bruised, or should it be fine-ground? I have stated the *practice* of different breeders; the reader will draw his own conclusions. The turnip question, in connection with abortion, is one on which wide differences of

opinion exist. As turnips are largely used for sheep, it may be useful to quote from one or two competent authorities upon sheep-management. Mr. Henry Woods, of Merton, in his Lecture on the 'Diseases of Sheep' (published as a pamphlet), page 35, referring to abortion in a flock of ewes, says: "Feeding will, I believe, be found to be the main cause, especially feeding on turnips, as is done on some of our large flock farms;" and he considers that "we do not give sufficient dry food to counteract the evil effects of turnip-feeding." He is here alluding to the practice of "feeding our ewes *wholly* on turnips." Mr. Woods also introduces his impression about the effect of turnips grown from superphosphate of lime used as manure. But this opens up too wide a question for discussion here. I have asked of several sheep-breeders, in various parts of the country, their experience of the effects of feeding in-lamb ewes upon turnips. As their answers seem to throw some light upon the subject as regards cattle, and to suggest how and why turnips may be dangerous food, I will introduce one or two of their remarks. The first of the following extracts is from the letter of a member of the Council of the Royal Agricultural Society of England, well known as a breeder of Shorthorn cattle and Oxfordshire Down sheep—Mr. Charles Howard, of Biddenham. "We avoid as much as possible putting sheep upon turnips previous to lambing, as we do not consider them healthy food. I have known ewes when fed for some time on turnips bring dead lambs, but, as a rule, they go their full time. The lambs are suffocated by too much water, produced by the turnips, accumulating in the womb. I should advise that ewes, previous to lambing, be run upon grass; but when this is not practicable, and turnips must be used, they should have a plentiful supply of dry food, corn and cake. I do not think that cows in-calf would be injured by a *moderate* supply of roots." Mr. Thomas Bushby, the Southdown breeder, of West Preston Manor, in Sussex, says: "I think it would be very difficult to cause abortion by genuine feeding. My experience has been that *frosted* turnips are dangerous without dry food, and that no animal should come upon turnips very empty, or ravenous for food. Doubtless indigestion is a great cause of abortion, and indigestion is caused by the animals being over-fed at one time, and under-fed at another; so that the animal is sometimes very hungry, and, after feeding, cannot digest its food. Many persons have an impression that sheep may have too many turnips before lambing. I think the danger is from this want of discretion in the feeder. Regularity to five minutes shou
be strictly observed; and the manger should always be cl
up; that is, that the animal should not be over-fed, and a

its time of feeding have food before it—a thing we should greatly dislike ourselves. With a good feeder the animals lick the manger out; with a bad one the manger is always partly full." Mr. Bushby adds, that ewes in-lamb, in the latter part of the season, are penned in the field with the ewes that have lambs, and have turnips at their pleasure by day, and dry food at night. He has seldom known them cast their lambs, and his impression is that this is because they are never over-filled, and never too long without food. But the tied-up animal will loathe the food it is always breathing over. Punctuality, with judgment to gauge the capacity of each animal, he considers very necessary; and, as the most frequent cause of abortion, mentions sudden fright—from the discharge of a gun, a dog jumping over a wall, the steam from an engine, or anything else which startles the animals. All this, those know who have ever closely watched Shorthorns, is applicable to cattle; and another cause of abortion is neglect in allowing dead rabbits, rats, rooks, or crows, or any decomposing animal matter, to lie about the land. Cattle, especially when in a breeding state, are keenly sensitive to bad smells. Neglected gateways and watering-places, where heavy cows have to toil and strain themselves through knee-deep mud or clay, are also dangerous.

Some breeders separate calves from the mothers for the sake of the cows, that the cows may the more readily breed again; other breeders do it for the sake of the calves. This is the more important in the case of calves whose dams are deep milkers, for it is of no use to talk about bringing up calves in the "natural" way when the cow's yield of milk so far exceeds that of a cow in her natural state. A yield of five or six gallons a day is known only under highly artificial conditions; and to give a calf unrestricted access to such a supply would be to place it in great danger. In some places, if the cow is a deep milker, the calf is put in a little railed-off corner of her box, where she can see and lick it, but not feed it. The instinct of the cow to lick the calf should not be overlooked. The bloomy appearance of suckled calves is partly due to this motherly attention, and the licking along the calf's spine, which the cow, with her rasp of a tongue, gives her calf immediately after birth, has evidently an important meaning. All careful managers, when the calves are not reared by the cow, take care to imitate this process, rubbing well over the spine with a wisp of straw. This not only dries the calf and prevents its taking cold, but evidently strengthens it; and the calf, if a healthy one at full time, responds to the rubbing by vigorous efforts, soon successful, to gain its feet. The calf, penned off in a corner of the cow's box, is admitted to her for its meals so many times a-day.

The most common practice is three times a-day while it is very young, twice when a little older; but there are differences of opinion about this: some managers, remembering that in a wild or natural state the calf would suck often, prefer to continue the three times a-day; others, observing that while the wild cow yields to her calf frequent small quantities, the domesticated cow, unless a very bad milker, gives hers an ample meal, contend that three times sucking does not allow the calf plenty of time between the first and second, or second and third feed, to digest the milk. Then there is the system, which recognises both these views, of admitting the calf three times a-day, and regulating the quantity it gets by milking the cow while the calf sucks. When companionship of cow and calf without unrestricted access of the calf to the udder is desired, and the corner pen is not practicable, a basket-work muzzle is sometimes put upon the calf; but, after all, this seems a tantalising expedient, and it is questionable whether separation, with occasional access to one another, is not better for both cow and calf. To keep animals as free as possible from annoyance of all kinds is one of the principal rules of every well-managed herd. Any circumstance that frets, or fidgets, or disturbs, is opposed to thriving, and therefore wasteful of food. The wear and tear of "worry" taxes the food intended to form bone, muscle, or fat. Where the cow is hand-milked, and suckles her calf besides, would it not be wise to milk *before* the calf sucks? The calf, then, would get the richer strippings, and the cow be thoroughly dried each time—a matter of great importance. If milked *after* the calf has sucked, she is not always inclined to yield her milk to the last drop.

Probably among breeders of Shorthorns there are none who have paid more attention to the subject of management than Mr. E. A. Fawcett, of Childwick Hall, near St. Albans. Whatever differences of opinion may exist as to the expediency of his practice (and we must always make allowance for possible local reasons for or against any particular rule of management), there can be no question that every part of the subject has been carefully considered by him, and that whatever he does with his cattle, right or wrong, he is able instantly to give his reason for doing it; and that reason is always the outcome of deliberate thought. In a recent conversation with Mr. Fawcett upon the suckling system which he adopts, I found him strongly opposed to the plan of allowing the calf to run out with the cow in the field, for the following reasons:—(1.) If the cow is a great milker, the calf sucks from perhaps only one quarter, or it may be two quarters, of the udder; the two or three untouched quarters harden (or "stone," as a local term rather expressively describes it), and there is consequent danger of garget. (2.) The calf gallops, gets over-heated, lies down, gets chilled, takes cold, and (possibly) dies. (3.) The calf helps itself to too much milk and too often, disturbing the process of digestion; it becomes feverish, and perhaps dies, the danger being greatly aggravated when the dam is a deep milker. (4.) The cow, on coming indoors to be milked or stripped of surplus milk, will not yield her milk to the hand unless the calf happens to suck at the same time. (5.) The cow usually will not breed again so soon as if the calf is kept away from her except at suckling-time. Mr. Fawcett's success in management, as regards the fertility of his herd and immunity from disease and loss, is extraordinary. I have said that he rears the calves upon the suckling system, but this is not invariably adopted, for when a heifer calves at a very early age, and before she has got plenty of size and strength to enable her to bring up her calf without injury to herself, the calf is taken from her and brought up on skim-milk, boiled in a vessel plunged in a larger vessel containing water, so that there is no direct action of the fire upon it. The milk is then allowed to cool, and, when required for use, warmed up to new-milk temperature. There is some evaporation of the watery part of the milk, which becomes therefore more condensed nourishment. The same process of boiling the milk is understood to destroy the infectious power in the milk of cows in foot-and-mouth disease.

The objection to frequency of calves' feeding is perhaps based partly upon analogy; and it is worth while to consider how far analogy exists between the human subject and the ox. For mankind, the rule, briefly and forcibly set forth by Mr. Erasmus Wilson—in that popular treatise on the skin by which so much was done to extend the use of soap and water—is "to let that patient drudge, the stomach, alone during its three hours of labour and one of rest; to put nothing more into it while the mill is at work, nor when it is in repose gathering its strength for another grind. Tease it not, fret it not, if you would keep it in good humour; and without its good humour, alas for yours!" We should, nevertheless, remember man's food goes directly into the true mill, while the ox has a macerating paunch, and two other stomachs before the fourth or digesting stomach is reached; and continuous eating, for a long time, is the natural habit of the ox. Still, to a certain extent, the analogy may hold good. The same principle, also, which makes a great variety of food at one meal, and continuous sameness of food, injurious to the human subject, may be taken as a guide for the management of cattle; and if so, how injurious to the health of an animal must be that forcing in which it is necessary to tempt the animal's appetite by tasty mixtures! In pail-feeding, the risk of unequal quantities of milk—sometimes warm, sometimes cold—being given, seems great, and calls for attention and care. Cleanliness of the feeding-pail is also a matter of the greatest importance.

According to Culley, one great difficulty in his day was to avoid what was called "lyery" flesh, a sort of black lean, "as black and coarse-grained as horse-flesh," often abundant, but of bad quality and lacking the desired intermixture of fat. An opposite difficulty besets us now. The modern tendency is to excess of fat and scarcity of lean, so that animals when in poor condition are light-fleshed, and when in high condition are useful chiefly to the soap-boiler; and as the results of civilisation and education descend from human parent to child, and even acquired habits and peculiarities of manner are frequently transmitted to descendants—in the brute creation propensities artificially established become a heritable part of the animal's nature. Hence, as I have before suggested, the incalculable importance of management in relation to breeding for improvement.

Instinct has been described as inherited experience; so breed may be called inherited culture. Good land, careful management, the selection of animals which gave the largest and readiest return in milk and beef in proportion to the quantity of food consumed, and the rejection of animals inclining to the opposite of these characteristics, combined to produce what we call the Improved Shorthorn. This selection, no doubt, was to a great extent unstudied, at least as to the results towards which it was tending. The farmer kept for his breeding stock the heifers that best pleased him as thrivers and milkers, and weeded out those which cumbered the ground; just as his wife stuck to the pullets that proved good layers, and twisted the necks of all that could not earn their keep. Each farmer, doing the best he could for himself, probably thought little, if he ever thought at all, of the advantages which he was heaping up for posterity. The extraordinary powers of production thus cultivated through long generations became hereditary; so strongly hereditary, indeed, that they may survive much abuse and neglect, but they are not indestructible. "Strains of blood" are sometimes spoken of as if they were specific elements, analogous to elements in chemistry, always certain to produce, in stated combinations, foreknown results; but have not many stock-breeders discovered to their grief how utterly BREED may fail if not supported by skilful MANAGEMENT?

In his 'Notes on Fields and Cattle,' 1862, the Rev. W. Holt Beever happily illustrates the folly of attempting to deal with an improved breed of cattle like the Shorthorn without adequate means of maintaining its improved condition. He says (page 9):—"The breed invented by the Collings with such diligence and judgment, we should never recommend for the adoption of a farmer upon a small holding, or a poor soil; unless, indeed, he adopt the plan of buying food on a large scale—a principle upon which a three-decker could be farmed. . . . A more wretched animal than the Shorthorn on scant keep it is difficult to conceive—a faded tulip where a cowslip should have been."

Mr. R. O. Pringle, in his useful work 'On the Live-Stock of the Farm,' observes that "from the day when the calf comes into the world to the day when the matured animal is consigned to the butcher, the rule to be observed should be—*continuous progression, and no retrogression.*" This applies as aptly to stock reared for breeding purposes as to stock brought up for grazing. Retrogression is sheer waste of time and food, therefore of money. Without a good grip of these two elementary principles, as advanced by Mr. Pringle and Mr. Holt Beever, it is useless to attempt the management of a Shorthorn herd. Mr. Holt Beever does not imply that the pedigree Shorthorn cannot do as much as a common-bred animal upon ordinary keep. The Shorthorn, if owning a pedigree that means (as a pedigree *should* mean) the inheritance of personal worth, most assuredly can not only equal, but far surpass the common-bred animal, just as good land without manure can yield more than bad land under the same condition. That analogy is good for further application. The impoverishment of a highly improved flesh-making breed of cattle is, like the impoverishment of highly improved land, irrecoverable loss. Something of money value, which has been possessed, is in both cases allowed to go for no return or consideration. Several of the illustrations which I have taken prove what may be done with the Shorthorn upon very moderate keep, if care be taken not to stunt the growth nor to check the steady development of muscle.

Many subjects connected with the management of Shorthorns will suggest themselves to the reader, probably, as subjects that might have legitimately come within the scope of this treatise; such, for instance, as analyses of food, or classification of various foods according to their uses—to make bone, fat, or muscle; to stimulate, to give warmth, &c. But these chiefly are in themselves special subjects already most ably handled in the volumes of the 'Journal' by professional and other competent authorities. The veterinary parts of the subject, likewise, I have studied to avoid as far as possible; and as I have therefore abstained from quoting the best opinions, the necessity of avoiding also unprofessional *nostrums* was obvious. Specifics for the prevention or cure of diseases, and matters of that sort, might fill a volume of petty recipes, useful in its way. The idea here has been to keep in view principles of management and facts, and not to overlook opinions, when they were the opinions of thoughtful and experienced men.

There are a few more matters of detail I wish to notice. Next to beef, milk must have the place of favour with a great majority of the managers of herds. In future years, so far as we can judge the tendencies of current events, we shall be thrown more than we are at present upon dairy-farming as a source of profit and of the national food-supply. In the belief that without losing in the smallest degree the Shorthorn's usefulness as a grazing animal, we may largely increase its yield of milk, I am supported by the carefully founded opinion of some of the most practical and successful breeders of grazing stock. In all probability, the three-times-a-day milking would greatly tend to cause an increased flow of milk; and a great deal, I believe, might be done by attention to the bag. In hand-milking, a lazy milker goes to the hind-quarters of the bag first, because they are the easiest to draw; and for the same reason he sticks to them longest, so that eventually they increase, while the fore-quarters diminish, and a "can-bag," all down behind and shallow and shrunk in front, is the necessary consequence. Eventually, the fore-quarters become almost useless, not in the first cow that is so treated, but by gradual deterioration through successively mismanaged generations of cows, until in a great part of the stock, common as well as highly bred, which should be the dairy stock of the country, the capability of the udder is seriously impaired. More attention to this on the part of the owners of Shorthorn herds is urgently needed: not only on the part of owners of herds kept for the dairy, but more especially of the owners of bull-breeding herds; for it is the bulls bred from cows with no fore-bags that do the mischief all over the country.

Much care should be devoted to the exercise of young animals, and making them accustomed to the halter, the slip-noose of which should be knotted or "locked," as the ordinary term is, to prevent its tightening upon the animal, pinching and so causing great pain and consequent restlessness. This is especially important in tying animals up in horse-boxes, or other means of conveyance for travelling. In driving cows the stick should be raised only to point the way, a hint which properly treated animals readily take. Otherwise the stick is seldom necessary, and, if necessary, must be used with a light and careful hand. The abominable cruelty of tail-twisting will never be permitted by any intelligent owner. The herdsman who loses his temper with the cattle under his charge is totally unfit for his place. He must have a kindly liking for them in order to get thorough control over them. A herd of shy, frightened cows is one in which a leading principle of management has been overlooked, and a savage bull generally means a savage man. I have found herdsmen, as a rule, exceedingly kind to the cattle under their care, but occasionally a man—far oftener a cow-boy—needs looking after.

A frequent, quick-eyed inspection of a herd, with a view to minor casualties, may spare many and heavy losses. An eye injured by a thorn in a hedge, or threatened by the ingrowth of the horn; a piece of stick or dirt between the "claws" of the hoof; the hoof itself cracked, broken, or over-grown; loose teeth in young animals, "wolves' teeth" in those of full age; to say nothing of the importance of careful watching for returns to service, preparation for calving, and the earliest symptoms of cold or illness of any kind: these are among the multitudinous matters for which the manager of a Shorthorn herd must be, either personally or by a trustworthy proxy, ever on the alert. Rock-salt placed in large lumps in the boxes, and in the fields, for the animals indoors and out to lick; a lump of chalk, securely tied, hanging (like a kitten's cotton-reel) within reach of each calf in its pen; an earth sod for loss of cud, mint-tea for a calf that has got a chill, a raw egg occasionally for one that wants strengthening: these are among the hundreds of small particulars, which it would be impossible to enumerate here.

In all districts but those where the climate is exceptionally genial during the autumn and early winter (parts of Ireland, for example, near the sea), cattle do much better when housed early in the autumn, and turned out proportionately early in the spring. When too well-fed and too long confined in spring they do not thrive so well; and when kept too long out in the cold autumn nights, their hides thicken, and, in popular phraseology, the animals are long before they "get the cold out of their bones." In turning out by day in winter, too, it is most important to take the cows in as soon as they draw together towards the buildings, and not let them stand at the gate, wearing off their flesh with the cold, perhaps catching settled complaints, and almost certainly ripping one another with their horns, the latter being one of those causes of abortion for which, perhaps, turnips get the blame.

I have alluded to the necessity of keeping animals contented and pleased, and the bad economy of permitting disturbance or any sort of annoyance to the cattle. Relative to this, it is obvious that kindness towards the animals is of incalculable importance; and it should be not only negative but positive kindness. Cattle are more amenable to the power of gentleness than would be imagined by those who are not familiarly acquainted with them. It keeps them in a good humour, and although they don't literally "*laugh* and grow fat," they certainly do extract from their food the more visible and tangible results in proportion to the quietness and happiness of their lives.

XXIII.—*Laying down Land to Grass.* By JAMES HOWARD, of Clapham Park, Bedfordshire.

THE object of this paper is not to discuss the policy of turning arable land into pasture, but simply to describe my own practice. For two or three generations past the ploughing up of old grass-land has, to a greater or less extent, prevailed in this and the surrounding counties: the unprofitableness of corn-growing during the past few years has not only brought this custom to an end, but has led to an opposite course. The change which has come over the prospects of agriculture has, moreover, caused landowners to regret the conversion of their pastures into tillage, and many are now anxiously inquiring as to the best methods of restoring their land to grass.

Eighteen years ago I purchased the Clapham Park Estate of the Earl of Ashburnham, and at once commenced laying down portions in pasture—a practice which I have, for residential and other reasons, continued up to the present time. During this period upwards of 200 acres of arable land have been laid down to grass.

The methods of laying down have been various. Before I proceed to describe them, I would remark that in forming an opinion upon any farm practice it is imperative that the kind of soil and other leading facts should be known. I would therefore state that the whole of my land is on the Oxford-clay and Boulder-clay formations; it has all been thoroughly drained, and was in anything but a high state of cultivation when it came into my hands. The average rainfall is 22 inches.

My first experience in laying down land to grass was upon a small farm belonging to a friend, and which I took on a long lease twenty-two years ago. On this farm I laid down a 12-acre field, following the ordinary practice of sowing the seeds with a corn-crop. My experience corresponded with that of most others who have pursued the same course; the grasses began to fail about the third or fourth year, although manure was from time to time applied, and no sheep depastured upon the field; several years elapsed before much progress was made towards the establishment of a turf. To the best of my remembrance it was not until about the tenth year that the grasses were well established: for at least seven years the field was not worth half the rental, the grass it produced not being sufficient to support the few young horned-stock turned out upon it, cake or other extraneous food being a necessity. I subsequently laid down other fields upon the same method, and with the same unsatisfactory results. The conclusion I came to was that much truth was expressed in the old Suffolk couplet:—

> "To break a pasture will make a man
> To make a pasture will break a man."

About sixteen years ago I was induced to try the system of inoculation. The previous preparation of the land in this case had been a summer or dead fallow. Strips were ploughed out of a good permanent pasture, and pieces about the size of the palm of the hand laid down about 9 inches asunder, the man treading down each piece with his foot. Mixed seeds were subsequently sown, and a light roller passed over the ground. There can be no doubt that a good pasture is more quickly obtained by this method than by any other; the chief drawback is the expense. I calculated that the cost of the experiment was not less than 3*l.* 10*s.* to 4*l.* per acre. Another drawback is the injury done to the pasture from which the strips are taken; this to a great extent has been avoided by the plan of ploughing out very narrow strips, adopted by the Duke of Manchester, who has practised the system of inoculation at Kimbolton (a few miles from here) with eminent success. The Kimbolton Park experiments, with the improvements in the method introduced by his Grace, are well described in the 'Journal' for 1876, Volume XII.

On one side of my inoculated plot is old turf, and on the other newly-sown pasture, all three being in the same field. Several years ago my bailiff called my attention to the fact that the stock preferred the inoculated portion to either of the others, and to the present time this preference is constantly observable by the closeness with which the grass is grazed down, and also by the cattle being seen so frequently upon it.

Before trying the plan of inoculation, I had become convinced of the necessity of giving poor clay-land, intended for grass, a summer fallow and laying it down without a corn-crop. My reasons were, (1) to clean it thoroughly, (2) to restore its fertility, and (3) to obtain a fine and suitable tilth.

In consequence of the summer of 1862 being continuously wet, the cleaning of a field particularly foul and full of couch-grass was rendered impossible; I resolved therefore upon giving it another year's fallow, solely with a view to get it clean before laying it down. The result of this accidental circumstance proved most favourable; the grasses not only grew vigorously, but the dying out about the third or fourth year—so invariably the case with new pastures—was far less observable. The only reason to account for the superiority of this field over a piece adjoining, laid down after a dead fallow of one year, was that the two years' rest had so restored the condition of the soil that the grasses found all the nourishment in it they required. To this method of treatment I shall again have occasion to refer.

Sixteen years ago I acquired, by exchange with a neighbour, a small field of 7 acres which was in sainfoin when it came into my possession. This field, being a short distance from my house and immediately in sight, I postponed, year after year, ploughing up and sowing down in grass. As the sainfoin began to die out, indigenous grasses began to make their appearance; I determined, therefore, not to carry out my intention of ploughing it up, but to try the effect of sowing renovating grasses, and manuring the field tolerably often. The result of this course was that I obtained a very fair piece of pasture, which at the present time is not at all inferior to some in close proximity sown down nearly twenty years ago with a corn-crop.

Last year I planted another field intended for permanent pasture with sainfoin. I adopted this course, instead of a two-years' dead fallow, out of deference to the wishes of my bailiff, who reminded me that he was expected to make the farm pay, but how, he asked, was he to do it with so much land being laid down if he had to wait three years for a crop? For the same cogent reasoning, four years ago I sowed a 16-acre field with lucerne, upon which, two years afterwards, I sowed permanent grass-seeds. Mr. Martin J. Sutton, in his work upon 'Permanent Pastures,' has expressed an unfavourable opinion of sowing grasses in lucerne; notwithstanding this adverse opinion, from the beautiful carpet of green my field presents this spring I have every reason so far to be satisfied with the experiment.

Hitherto I have dwelt upon the different systems pursued; I now proceed to make a few general observations upon the sowing and subsequent management of newly sown pastures. As already intimated, I greatly prefer sowing down without a corn-crop: on poor clay soils the grasses require for their support the manurial elements which a crop of corn takes out of the land. In cases where the land has been exhausted or brought into low condition, a two-years' dead fallow will be found the cheapest way of restoring fertility, and bringing it into a condition to sustain the grasses through the critical years already alluded to.

It is often asserted that the practice of sowing down with a corn-crop is attended with a twofold advantage, viz. the young grasses are sheltered by the growing corn, and the sale of the grain raised together with the straw pays a good portion of the expense of laying down. In respect of shelter, I have found no need for it either with spring- or with autumn-sown seeds. As to the corn repaying the expense, there might have been some force in the argument when wheat was worth 10*s.* per bushel; but at the prices which have ruled of late, I cannot think the practice can pay, more particularly when it is remembered that corn and grass belong to the same natural order of plants, and therefore extract from the soil the same elements of plant-food. It should further be borne in mind that an essential point in laying down is to get the land into good heart; to go therefore the straightest way to take out the very condition required for the sustenance of the grass plants surely cannot be wise or a course to be commended.

With respect to the sacrifice attending a two-years' fallow, I would observe that it is simply the rent, the rates, and the cost of an extra ploughing and one or two scarifyings of the easily moved tilth. Land which has been highly farmed for a number of years may safely be sown down after one year's fallow. I have a 10-acre field near to my house which, being in high condition, I sowed down in this way in 1876, and which promises well, no renovating grasses being at present necessary. Whichever method is pursued, the land should be scrupulously clean before sowing.

I have stubbed up 30 acres of wood, most of which was sown down after a summer's fallow, and with fair success, but I should be disposed to adopt the two-years' method in future, and this with a view to give the raw soil, a good deal of which is invariably brought to the surface, a more thorough aeration; I have come to this conclusion, inasmuch as a piece I sowed down in 1877, after one year's fallow, requires renovating grasses this spring.

Great diversity of opinion exists as to whether the grass-seeds should be sown in the spring or in the autumn. Having tried both plans, I have no hesitation in expressing an opinion in favour of the latter, and for this reason: if sown in the spring, when vegetation is quick, the weeds run a race with the grasses, get possession of the ground, and entail great expense in weeding; if sown in the autumn, when vegetation is less quick, the grasses have a clearer course, grow more rapidly than weeds, and a thicker plant of grass is the result. The heavy and light seeds should be sown separately but simultaneously, one sower following the other.

To lay down absolute rules for the treatment of newly-sown pastures is far easier than, according to my experience, is the putting of them into practice. The exigencies of a farm, full of live stock, and fitful seasons upsetting previously formed plans, are apt to override all preconceived notions. If possible, I would avoid putting sheep upon new pastures until the grasses are thoroughly well established. The Persians say, "The sheep has a foot of gold, and turns to gold whatever it treads upon." The proverb doubtless contains much truth, but it does not hold in the case of new pastures; not that the feet of the sheep are injurious, but their teeth are formidable enemies to young grasses. If compelled to stock with sheep, they should be folded, the folds of ample size, and moved daily, especially in showery weather; in very wet weather the sheep should be taken off. Roots or other artificial food should of course be given.

If sheep are simply depastured, they wander over the field and pick out and gnaw down the finer grasses, to the injury or destruction of the pasture; if confined in a fold, the same injurious results do not appear to follow, at all events not to the same extent. For new pastures, young horned-stock are best, especially for clay soils. Until a turf is formed, cows or bullocks are too heavy, and horses especially are to be interdicted, not only on account of their weight, but because they bite so close to the ground; indeed they bite into it when the herbage is sweet. Until the grasses get well established it is desirable, if the exigencies of the farm admit, to avoid mowing. If young pastures are mown, a light coat of dung should be applied after the crop is removed, or as soon as convenient.

In respect of manuring, a very successful and experienced farmer expressed an opinion to me many years ago that grass-land should be manured little and often, that heavy dressings promote the growth of coarse, rank grass: observation has led me to the conclusion that the dictum is sound.

The spreading of farmyard-manure upon grass-land is too generally carelessly and imperfectly performed. To ensure its being evenly and uniformly spread over the surface I have, for some years past, used the haymaking-machine. When set in the forward action, a strong haymaker shakes out and scatters the dung most thoroughly: for this work a windy day should be avoided.

I have not found bone-manure, either in the form of superphosphate or ground bones, have any marked effect upon either old or new pasture. As I had a bone-mill on the farm, and made my own superphosphate, there could be no question as to purity. Whether the absence of effect arises from the fact that in boulder-clay soils are found large quantities of small pieces of chalk and limestone, continually undergoing decomposition, I am unable to say, but the want of effect of bone-manure was year after year most apparent. Nor is my experience in this matter singular; I have met with many who have tried bones with the same want of success. Coal or cinder-ashes have a very marked effect on both old and new pastures; I attribute this to their mechanical action in keeping open the surface and preventing it getting "hide-bound;" for I have noticed similar effects to proceed from the application of road-scrapings, brick-dust, and sharp sand.

The sowing of renovating grasses and white clover about the third or fourth year will, as a rule, be found desirable; the quantity should of course be regulated by the extent to which the grasses have lost plant: about 6 lbs. of seed per acre will generally suffice; the chain or flexible harrow should be passed over the ground once or twice. The whole of my grass-land, new and old pasture, is gone over with a flexible spiked harrow twice a year—spring and autumn. At the end of the autumn, in addition to disturbing any moss which may have formed, or rough grass which may have become matted, the effect of the harrowing is to distribute the cattle-droppings, and to let in any grass-seeds which have ripened and fallen on the surface.

In conclusion I would observe, that the question as to the best method to be pursued depends very much upon whether the laying down has to be done by the landlord or the tenant. If by the former, and the land is similar in character to my own, I should have no hesitation in deciding in favour of the two-year dead-fallow system, feeling assured that the time lost at the beginning would be speedily regained, and this whether sowing or inoculation were adopted. If by a tenant, he would scarcely be justified in pursuing this course, unless the rent were remitted for two or three years, or he was in possession of a long lease with liberal covenants, or in some way reimbursed for effecting this permanent improvement.

To the ordinary tenant who resorts to laying down, or is compelled—for reasons which need not be entered upon—to adopt this course, the plan of sowing upon a sainfoin or lucerne layer offers many advantages, the chief of which is there is no great or immediate sacrifice, valuable crops are being taken off during the time the grasses are establishing themselves, and by the application of light dressings of manure a pasture will in a very few years be obtained, the value of which will depend to a great extent upon the manner in which it is treated. When a choice of fields for laying down can be exercised, I should prefer those which are difficult and expensive to till, particularly hill-sides and uneven ground.

If corn-growing should remain as unprofitable as it has been the past few years, I see no alternative but the putting such land down in grass, and raising young cattle and hay upon it. This in its social aspect is a retrograde movement, but "necessity has no laws." If corn-growing should again become profitable, the same land would for many years be far more valuable for arable purposes because of the rest it had had—at all events the farmer in the meantime would be relieved of all anxiety arising from unfavourable seed-time, inclement winters, disastrous harvests, and other perplexities incident to the growing of grain-crops.

Clapham Park, Bedfordshire, April 1880.

XXIV.—*Report on the Studs and Breeds of Horses in Hungary.*

By J. COLLINS, Principal Veterinary Surgeon to the Forces.

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THE Government studs in Hungary are established for the purpose of breeding stallions for the service of the mares of the country. They do not breed horses for the army, or for sale, with one exception, to be noted hereafter. Sales are held annually at each establishment, but simply for the disposal of colts and fillies, that are considered unfit for stud purposes, and the worn-out and useless mares and stallions.

There are four studs, as follows:—

At Mezöhegyes, Department Csanád.
At Kisbér, Department Komárom.
At Bábolna, Department Komárom.
At Fogaras, Department Transylvania.

MEZÖHEGYES.

Founded in 1785.—I inspected this stud on the 28th and 29th of August, 1879. There are four troops of brood mares of distinct types, as follows:—

1. Half-bred, English	84
2. Nonius, large	67
3. „ small	94
4. Gidrans	81

The original stock from which these mares are, by repute, descended was very mixed. It is said to have been the indigenous breed, undoubtedly, I think, of Eastern origin, crossed with horses from Transylvania, Bessarabia, Poland, Mecklenburg, Turkey, and, no doubt, from many other sources; but the distinctive characteristics of the present brood mares were obtained, in comparatively recent times, from well-known imported sires.

The half-bred English troop of mares was founded about 1840 by the descendants of two imported English horses, named "Furioso" and "Nordstar;" but whether these were thorough- or half-bred, I could not ascertain. The produce of the first-named is crossed with the second, and *vice versâ;* but from what I could learn they were not kept rigidly distinct, as the Arab cross is found to exist in some of the mares, and probably other strains. The troop of mares are all full bays, no white. I may here remark that bay is the prevailing colour of the horses of Hungary. The grey horses are all of Arab or Eastern descent. They are a very fine lot of mares indeed; height from 15 to 16 hands, average 15·2, possessing all the characteristics of the English horse; in fact, it would be difficult to distinguish them from our own breed. Their points are good throughout; with good hocks, excellent backs and loins, and great breadth under the knee.

The two types of the "Nonius" breed are said to be of French origin, from a stallion of that name captured, in 1815, in Normandy. The Nonius horses are distinguished by their large coarse heads and Roman noses. The large Nonius mares measure from 15·2 to 17 hands; some of them are very fine, and would do for horse artillery, or carriage purposes. This caste is very numerous throughout all the stallion depots, and furnishes their largest-sized horses. The mares being specially selected through many generations are, no doubt, excellent; but the large Nonius stallions are, I think, in numerous instances, very defective, as I shall have occasion to notice when remarking on the stallion depots. The small Nonius mares are, as their name indicates, of the same extraction, but smaller; height from 14 to 15·1, or so. I liked these mares very much, and stallions of this class are very numerous, and better suited for the small country mares.

The "Gidrans" are all full chestnuts, of Arab extraction, crossed with the English horse. The troop was founded by a pure-bred Arab named "Gidran," imported in 1818. For a number of years this caste was kept distinct, and composed entirely of the pure Arab breed; but, to correct faults common to the Arab, they were crossed in late years with the English thoroughbred, and the cross has been found to answer admirably. The troop is now essentially Anglo-Arab. The only objection to them is that they are small, 13·3 to 15·1; but from the fact of the stud authorities being about to divide the troop, as in the case of the Nonius horses, into large and small, it is to be inferred that by judicious crossing the defect, as regards size, is being remedied. The Gidrans I liked exceedingly. They show much Arab blood, but their action is better than the Arab, and if only a little bigger, 15·1 to 15·2, would be the perfection of hussar troopers.

In addition to the four troops of mares described, they are forming a troop of Norfolk mares, the nucleus of which consists of a few of that breed imported during the last few years; but, from some reason or other, they were not shown to me. From what I could gather, the result is not considered altogether satisfactory; but in course of time, no doubt, by judicious selections, extending over some years, a troop of this class will eventually be fully established.

I inspected all the young stock, as follows:—

Yearling colts	99
" fillies	93
Two-year-old colts	138
" fillies	86
Three-year-old colts	68
" fillies	60
Foals of this year	231

The colts and fillies are brought up and stabled on attaining 3 years of age, and kept until the following spring, when the selection takes place, the best colts being retained for district stallions, and the fillies for the stud troops of brood mares. The remainder are sold off, the colts being previously castrated, and both colts and fillies broken to harness.

Each troop of mares, also the colts and fillies of their respective sex and age, are always kept perfectly distinct, both at pasture and in the studs, and are tended by well-mounted hussars armed with stock-whips. I was much struck with the excellent condition of the young stock; how well grown they were, and how well their limbs were developed, which can be attributed only to good keep and great care. The foals of the year were just weaned at my visit. They are fed with crushed oats as soon as they are able to eat them,—that is, when a few weeks old; and the oat-feeding continues throughout their career. The foals are brought in three times a-day to be fed with oats. The buildings used for the purpose, as well as to afford protection during the frosts and snow of winter when grazing is out of the question, are large erections some 100 yards in length, very lofty, solidly built, with large arched openings facing the south. Attached to them are extensive railed-in yards, where the mares and foals can remain at will; ample short litter covers the floor, and a large low manger extends all round the walls, with rack-chains attached to the bottom. Each foal walks to his own place at the manger with the greatest regularity. At one end is an ample trough kept well supplied with fresh water. The different troops of mares and young stock were all out grazing in various parts of the estate at my visit.

The estate of Mezöhegyes is very extensive, consisting of some 30,000 acres, and everything for the use of the stud is grown on the farm.* The pasture, in our sense of the term, is very indifferent; the face of the country at the period of my visit (August) much resembled India; flat, sandy, very hot; everything parched and dried-up. Protection from the sun is afforded by belts of the quick-growing acacia-tree, which stretch away for miles over the country. The pastures are formed by artificial grasses, ryegrass, clover, lucerne, &c., and huge stacks of hay are dotted all over the estate. If the young stock, however, had to depend solely on the pastures, as they do in Ireland, for example, very different animals would be the result; they would resemble the Indian country-bred,—thin, lathy, spindle-legged, flat-sided, and which, if worked early, become "knocked-kneed" and "cat-hammed;" and this is the condition in which we find the average run of horses of the country, clearly showing that good keep is the first essential in the improvement of any breed of horses, given either by rich natural pastures, as with us, or by artificial diet, as is carried out in these studs.

The home-stallions, that is, those used exclusively for the stud mares, are 17 in number. They are of the following breeds:—

English, full and half-bred.
Anglo-Arab.
Anglo-Nonius.
Gidran.
Norfolk.

The large horses owe their size to the English blood; on the other hand, all the small stallions have more or less Arab blood. The largest stallions are the Nonius horses; the small are Gidrans, or pure Arabs. There is also a cross of the Nonius-Gidrans, which is thought much of. I was of opinion that all these stallions were very well selected; their points were excellent throughout; they were of the right size, with undeniably good joints and legs, and of good action.

The names of the original imported sires are retained during many generations. On walking through the studs and stallion depots, the pedigrees, as may be seen written up at every head-post, indicate how much the English blood has been resorted to, from the familiarity of the names. In addition to those already mentioned: viz. "Furioso" and "Nordstar," the founders, so to speak, of the improved Hungarian breed, we meet with such names as "Ostregar," "Macbeth," "Codrington," "Exact," "Amity," "Pride of England," "Rector," "Lismore," and many more of pure English descent. The colts, if kept for breeding, retain the name of the sire from which they are descended, with a number, so that we find "Furioso XI.," "Nonius XXIII.," and so on, the name and number corresponding with the stud-book entries. Both colts and fillies bred in the studs are branded, when weaned, on the near side under the saddle. Each caste has its own distinctive brand, for example—

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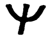
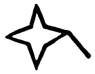
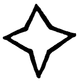
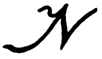
* This is by far the largest of the four studs.

+ signifies an animal of the Nonius stock.

 „ „ Furioso stock.

 „ „ Nordstar stock.

 „ „ Gidran stock.

 „ „ Tarpeo Nonius stock.

Z „ „ Zdenko stock.

Formerly the brand was placed on the quarter; this is now abolished, but the practice of branding on the shoulder, quarter, and neck in large letters is common in the private studs, and, like the brands on Australian horses, they much disfigure them.

The home stallions are very fine specimens of their respective classes, and I think very little fault could be found with them. The large Nonius are, if anything, too tall, but they all have excellent limbs. There is here also a splendid specimen of the Norfolk horse, called "Highflyer." He is excellent, but unfortunately his stock is not well spoken of. It seems as if the cross of the coarse horse is too violent for the Eastern strain of blood, and that our thorough, or three-fourths bred horses suit better the Arab stock. I saw several specimens of the Norfolk produce; they look coarse, are unevenly made, and are not at all in favour with the country breeders; but I think they are right to persevere, as what the country breed wants is bone and action, and it is probable that in the private studs, where a heavier class of mare is to be found, as well as in certain districts on the Austrian frontiers, where the German peasants still retain the coarse-bred German horse, the Norfolk cross will do good service. The Anglo-Arab and Gidran stallions were very good, and if the country mares were of the right sort, and the foals properly fed, no horses would surpass their produce for breeding, activity, action, and all the essentials required in good saddle-horses.

I closely inspected the 68 three-year-olds, selected for the district stallions next spring. Many, I thought, were too tall, especially the Nonius horses, leggy, and flat-sided.

There are about 230 casualties annually amongst the Government stallions in the country, to be met by the produce of the four studs.

KISBÉR STUD.

On the 9th of September I visited the stud at Kisbér, in the department of Komárom, about five hours from Budapest by rail, and about seven hours from Vienna. The estate consists of about 12,000 acres. The stud is composed of stallions and mares, which are exclusively of English blood, either thorough- or half-bred; no extraneous cross whatever. Here stands "Buccaneer," famous as the sire of "Kisbér," a Derby winner; also "Cambuscan," sire of that extraordinary mare which has never yet been beaten, and is still on the turf,—viz. "Kincsem." Both "Kisbér" and "Kincsem" were bred in the paddocks of Kisbér. There are seven home stallions here, as follows:—

Buccaneer,
Cambuscan,
Ostregar,
Young Buccaneer,
Bois Russel,

and two half-bred Furiosos of English descent.

During my visit the famous French horse, "Verneuil," by "Mortemer," arrived, which the Government had just purchased for 7800*l.*, to stand here. I naturally was much interested in these famous animals. "Buccaneer" is rather a coarse-looking horse, of a dark rich brown, but looks like a half-bred. "Cambuscan," a dark chestnut, on the other hand, has more style about him; he is handsomer, and shows more quality. "Ostregar" is a fine well-bred looking horse, with excellent points. "Verneuil" is a very tall chestnut, with drooping quarters, and toes slightly turned out, but is a grand mover.

There are 25 English thoroughbred mares, and 102 half-bred English. Amongst the thoroughbreds we find such noted mares as "Mineral," "Beeswing," "Gratitude," "Deception," "Firefly," "Honeybee," "Imperative," "Pauline," "Verbena," "Fancy," &c. &c., for each of which large sums were given. These mares occupy the home paddocks, of which there are a large number; two or three mares, with their foals, being in each paddock, and to each is attached a small shed and yard. The ground is somewhat hilly, but the pasturage is much better than at Mezöhegyes, and it is well-watered by a stream running through the estate.

I think that everything in the way of care and good management is carried on here to ensure the success of the establishment. It was, in fact, a treat to see such splendid animals, and to see with what sedulous care they are tended, and the young stock reared.

The thoroughbred stock is sold by auction when yearlings. In this way "Kisbér" and "Kincsem" became private property. It is only at this stud, and with the thoroughbreds, that the yearlings are sold without reserve. But although they become private property, it is a condition of the sale that, on the termination of their career on the turf, they must return and end their days as stallions or brood mares in Hungary. About 15 foals are thus sold every year, for an average of about 5000 francs per head, although as much as 30,000 francs have been obtained for one only. It will be seen from this that the home thoroughbred stallions are recruited with imported stock, so that the source of the stream is being constantly renewed by the best English blood.

I inspected 19 half-bred three-year-old colts, intended for district stallions next spring, principally the stock of "Ostregar," "Bois Russel," "Cambuscan," and "Buccaneer," out of half-bred mares of pure English descent.

The troop of half-bred mares, 102 in number, was divided as follows:—

Brood mares with foals	44
,, barren	20
Young mares (23 in-foal)	38
Total	102

Of foals of the year I inspected—

Thoroughbred	10
Half-bred	64
Total	74

These brood-mares are all excellent,and could not be surpassed in any country. I noticed some exceptionally good by the English horse "Diophantus," and the French horse (English blood) "Bois Russel."

I also inspected several colts and fillies (half-bred) that were to be sold by auction the following month, on account of defects which rendered them unfit for breeding, such as spavins, curbs, badly-shaped hocks or fore-legs.

BÁBOLNA.

On the 10th of September I visited Bábolna, about 20 miles from Kisbér, also situated in the Comitat de Komárom. The estate comprises about 8000 acres. This stud was founded in 1789, and is confined exclusively to the breeding of horses of Arab descent. We find here no English thorough or half-bred, but only the Eastern type.

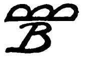
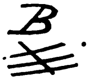
There are eight home-stallions, as follows:—

Arab imported	1
„ home-bred	4
„ half-bred, dam uncertain	2
Würtemberger	1
Total	8

Some of the crosses employed in former years were with Spanish and Neapolitan horses, to correct the great fault of the Arab, viz. want of action; but the cross has not, on the whole, been successful. The stallions are fine specimens of the Eastern breeds, but want action. They have low shoulders and "toe the ground." I was somewhat surprised that horses possessing good action were not retained. They are rare, it is true, but they are to be found.

The prevailing colour here is grey; in fact, it may be taken for granted that all the grey horses met with in this part are of Arab extraction. There are 26 mares said to be of pure Arab blood, and 100 half-breds. The best-known names amongst the imported sires in connection with this stud are, "Shagya," "Radban," "Amerath," "Bojraktár," "Jussuf," and "Mehemet Ali;" and one or other of these names will be found in the pedigrees of most of the Arab stock serving in the country.

The brood-mares were running at large; and I must confess I was greatly disappointed with them. There was scarcely one with a good shoulder; as usual with the Arab, low forehand, no action, and small. Of course they all show high breeding, and their powers of endurance cannot be called in question; but they certainly are not up to weight, and they contrast unfavourably with the English breeds. During several years' residence in Bombay, I had ample opportunities of knowing thoroughly the Arab and Eastern type of horse generally, For hot countries and scant pasturage they would, of course, hold their own, where the English breed would decay and ultimately vanish; and on this account the breed is invaluable in semi-tropical countries like many parts of Hungary. At all events, the heat of summer, as I could testify, is very great, and the climate, pasturage, trees, fruits, and corn, as well as the appearance of the country generally—dry, sandy, and burnt-up—are more like what one sees in parts of India. In temperate climes, with good keep, the Arab in time grows into what we see in our own stock; but the English horse never, in hot countries, holds his own with the Arab—he declines, degenerates, and disappears.

Foals bred at Bábolna are branded thus  on the near quarter, but the pure-bred foals—that is, by imported sire and dam—have the brand on the near side under the saddle, with an addition, thus .

I inspected the young stock, as follows:—

Two-year-old colts	28
„ fillies	39
Yearling colts	36
„ fillies	22
Total	125
Foals of the year—colts	40
„ fillies	38
Total	78

115 mares produced 97 foals.

I saw a number of four-year-old fillies that were about to be sold at the customary annual auction. They were very neat, round, compact animals, about 14·2 to 15 hands; but there was no action or style about them, and they seemed better adapted for harness than the saddle.

The pasturage is better about here than it is at Mezöhegyes; the ground lies low and the water lodges.

As regards soundness, the home-stallions were far from perfect. I noticed one quite a cripple on his fore-feet, and another very badly spavined.

FOGARAS.

The stud of Fogaras is situated at the foot of the Carpathians of Transylvania, south-east of Hungary. I had not an opportunity of visiting this stud. As it is principally for breeding-stallions, to improve the breed of mountain ponies of the district, and a long distance off, I did not think it of sufficient importance for the purport of my visit to go specially to inspect it.

The stud was established as recently as 1874, as I was informed, and composed of stock drafted from the Austrian stud at Lippica, near Trieste. The stock consists principally of crosses of Spanish, Neapolitan, and Arab blood. Of these there are five strains, known as follows:—"Majestoso," "Conversano," "Favory," "Pluto," and "Neapolitano," from the names of the original sires. There are nearly 100 brood-mares. The breed runs small—in fact, ponies and galloways; but I have no doubt that, of their kind, they are excellent. I saw several small horses, said to have been bred in Transylvania, and they were certainly, for their size, remarkably good.

ORIGINAL HUNGARIAN BREED.

Being anxious to see the reputed original Hungarian breed of horse, which is said to have been preserved intact from a remote period, I proceeded to Debrecsen (Comität di Hajdu), where a troop of these horses is kept, on the 13th of September. I found that they present distinctive characteristics not found so fully developed elsewhere, although the "caste" can be seen more or less stamped all through the country. If we take the conformation of these horses into consideration, we find the following:—

Large head, long ears, Roman nose;
Thick throat and neck;
Good broad chest;
Shoulders straight and low;
Long back, flat loin;
Hind legs far behind;
Good flat legs;
Hocks close together;
Excellent quarters and thighs;
Rather light barrel;
Colour, full bay; height, 14 to 15·2; average, 14·2.

The pure Hungarian, then, is by no means a handsome horse; if anything, the reverse. He has some of the characters of the Persian, with a Norman cross. Mr. Kish, an old and influential resident gentleman of the highest authority here, informed me that there was, a long time ago, some infusion of Spanish blood. This may account for the round, ugly nose, from the Norman cross which the Spanish horse possesses; and it is very likely that the prancing, high-stepping Spaniard was introduced to improve the action of the original breed; as I believe to this day, in the Austrian stud at Lippica, horses of Spanish and Neapolitan extraction are retained for the purpose. The indigenous breed of early days was, I should think, undoubtedly of the Eastern type. However, at the present time these horses are by no means distinguished for their action. I would say that the Hungarian horse, as we see him here, is essentially a harness horse, and unfitted, from his conformation, for the saddle. In fact, he is used almost exclusively for draught, and ridden only when he has to carry the hussar or dragoon for military purposes. He has a great reputation for endurance, and will travel long distances.

I was informed that the only time oats are given is during the first winter after the foal is weaned, and during work; at other times he is exclusively grass-fed. But then the pasturage about Debrecsen is the best I have seen in Hungary, very different to the pasturage at Mezöhegyes.

The pure Hungarian is branded on the near quarter thus: $\overline{\text{DV}}$.

STALLION DEPOTS.

The number of State stallions employed throughout the country is from 1750 to 1800. These, as before mentioned, are bred in the Government *haras*, with the exception of some 40 or 50 purchased from outside. It is the object, I believe, in time to gradually reduce the number, as the breed of the country improves and becomes established; but this, I fear, will be at a very distant date, as I shall have occasion to refer again.

The expense of keeping up these large establishments is enormous, I believe over a quarter of a million sterling annually. The price charged for the service of the horses is very small, ranging from 15 to 30 francs per mare.

Some of the stallions are let out for the season to the proprietors of private studs—generally some wealthy nobleman, or gentlemen of property and position—for which sums varying from 400 to 12,000 francs are paid. In this way some 80 to 100 stallions are let out. In no case is the number of mares to exceed 40 during the season. The stallions are only employed during four months in the year, viz. from March to July. During this period there are about 600 stallion-stations throughout the country. The stallions do not travel the country, as with us, but stand at certain well-known centres. From 2 to 8 stallions stand at each station. Each horse serves, on an average 30 to 35 mares a season. In some years as many as 60,000 mares are covered by the Government horses. This will give some idea how much the breed of the country must be influenced by them. At other times the stallions lead a life of idleness, simply exercise, at the principal depots, of which there are five, as follows:—

1. Székesfehérvár.
2. Nagy-Körös.
3. Debrecsen.
4. Szepsi-Szent György.
5. Varasd.

The 1800 stallions are of the following breeds.—

73	English pure bred,
45	Arab „
550	Half-English,
450	Half-Arab,
220	Normandy,
230	Lippica stud,
50	Norfolk,

and the remainder of mixed or uncertain breed.

Of the depots enumerated, I had an opportunity of inspecting those at Székesfehérvár (Sthulweissenburgh) and Debrecsen, and the sub-depots at Mezöhegyes and Babólna, altogether a total of 538 stallions.

I visited the first-named depot twice. There were 220 horses occupying six large stables. The stables I liked very much; they are solidly built, open to the roof, horses' heads to the outer wall, with a broad centre passage—in fact, on the same principle as our new model stables, with the difference that there is no ground ventilation, no skylights, and much fewer windows. Drainage surface. The stalls are simply divided by swing bales, and are very long, at least 14 ft. by 6 ft. The horses are tied up in the usual way, no heelropes. I was informed that accidents were rare; certainly of the half-dozen in hospital none were under treatment from kicks. They all seemed perfectly quiet and docile.

The diet consists of hay and oats exclusively; 8 lbs. of oats, 12 lbs. hay, and straw *ad libitum*. There is at all the studs and depots an excellent riding-school and open *Menages*, the former for breaking-in and exercising the horses, and for use in frosty or wet weather. The discipline and management is exclusively military, and everything appears to be conducted with the greatest care and regularity. The horses standing here afford an illustration of the class and breed in all the depots. For example, in the district of which this depot is the centre, there are 508 stallions, as follows:—

English	24
Half-English	240
Normandy	60
Lippica	30
Arab	20
Half-Arab	94
Divers not indigenous	40
Total	508

with this difference, that in districts where the mares are large, greater proportion of the English and half-English, including arge Nonius horses, are stationed; on the other hand, where he mares are small, the Arab and half-Arabs are located.

On the whole, I thought the stallions were excellent, and well selected. I was most struck with the Anglo-Arab, the English blood predominating. There were many excellent English full and half-breds. The large Nonius I think too big, they are more like tall van-horses. They all had excellent fore-legs, with great breadth under the knee. This point appears to have been specially attended to, as in all the studs and depots the breadth under the knee was remarkable. They all have excellent backs and loins. The defects which I noticed in some were indifferent hocks, and with the tall horses narrow chests; and I fear that a good many of the English and half-English were "roarers;" although this is a malady not at all common in the produce of the country; in fact, out of a large number examined (several hundreds), not one case of "roaring" was met with. This I attribute to the dry climate. In warm climates, and with the Eastern breed of horses, "roaring" is unknown.

I also noticed some excellent home-bred Arabs, *i.e.* from imported sire and dam, and was much struck with the effects of early feeding and good keep. Arabs, as a rule, are seldom over 14·2; yet some of these horses were 15·1 to 15·2, with all the fine characteristics of the Arab breed, showing unmistakably how essential early feeding is to obtain size and strength.

I noticed also some Norfolk horses; but I doubt very much if, with the small well-bred average breed of mares, they are suitable. The produce is coarse, unevenly made, wants stamina, and requires good feeding, and I believe is not in favour. It is probable that in those districts where the mares are large, as in Moson, Sopson, Vas, and Zala, on the Austrian frontier, where the German peasants preserve the larger and coarser German horse, that the Norfolk would answer, but the Norfolk does not improve the Arab. To give size to the latter, the English thorough or three-fourths bred is more suited.

In addition to the Government studs, there are numerous private studs throughout the country. I had not an opportunity of seeing any of these studs, but next the Government haras, the finest mares are there, I believe, kept, and the best horses produced, from the care and attention bestowed upon them.

The principal feature which arrests the attention of a stranger in visiting the Hungarian studs is the great importance attached to the imported English horse. Thorough and half-bred—in fact, the English blood—pervades more or less the whole stock with few exceptions, as where the Arab blood exists pure or mixed.

THE AVERAGE COUNTRY HORSE.

I will now describe the average country horse one meets with in travelling through the country. I attended the large fair at Sthulweissenburgh and Pesth, where I saw a large collection of the average breed. The vast majority are what we would call in this country weedy ponies, very well bred, with small limbs, bad hocks, narrow chests, narrow through, with, however, good feet, apparently docile enough, and of great endurance. Height 13 to 15 hands, the majority, however, are under 14. They show all the indications of deficient keep in their early foalhood and premature work, the same, or nearly so, as we find in the country-bred in India, and from the same cause—viz. deficient pasturage or keep. It is the sedulous effort of the Government to raise this standard by every means in its power, by providing good stallions and granting prizes; and there can be no doubt that, but for the persistent efforts thus systematically made, the breed would further degenerate. Climate does, however, in the long run determine what the race of horses or other animals is to be; and on this account I have no hesitation in saying that, with all the machinery, large and most costly establishments, and conducted on the best principles, the average breed of the country will never reach the standard of our own, for the simple reason that the pasturage, dependent on climate, is deficient in amount and nutriment. The only means of compensating for this want is by grain-feeding, what, in fact, we find is adopted in the studs; but for the ordinary country farmer this mode of rearing the young stock would be found too costly.

I was somewhat surprised, considering that the horse is of primary importance to the farmer in Hungary, that greater care is not bestowed on the rearing and feeding of the animal. I was under the impression, when serving in India as Superintendent of the Bombay Stud Establishment, that if the horse was a necessity to the Indian farmers in their agricultural operations, the breed would improve independently of State aid; but in Hungary it is not so. Horses of the stamp I have described, literally swarm over the country. With the exception of the heavy ploughing, which is performed by draught oxen, all the work of the farm, ploughing, harrowing, carting, marketing, travelling, &c., is done with their light four-wheeled waggons, drawn by a pair of ponies or galloways, often three, sometimes five abreast, with the foals running at the side, and, at an early age, these take their places in the team. Except in he German districts on the Austrian frontier, I saw no draught horses proper, and these were of Flemish or German extraction. I may except, however, a few imported heavy horses found in Pesth, in the waggons of the distillers.

Of course, I am now speaking of the average run of the country. In private studs, where greater attention is paid, larger and more valuable horses are bred and reared, and it is here where the large carriage horses are to be found, those standing 16 hands high; but horses of the class of our Irish hunter, or high-class charger, I should say hardly exist, at least I never saw one.

As regards the horses employed in the military service. I saw their hussars, dragoons, artillery, and transport. The hussars are mounted on the light galloways of the country, 14 to 14·3 hands high. The dragoons are mounted on the larger horses of the same class, 14·3 to 15·1. The artillery are horsed with a taller horse, 15 to 15·2 or 3.

From my observation, the small horses are the best. Those from 14·3 to 15·1 are wonderfully compact and neat, active with good action, and well bred, and excellent troopers for small light horsemen. They do not require much keep in comparison with English horses, and are capable of great fatigue. I saw a large number of this class that had just completed the anual drills of the yeomanry. They had been taken up from the peasantry, worked daily at drills, long marches, field days, &c., for three weeks, and the colonel informed me that the men were generally eight hours a-day in the saddle. The horses looked somewhat "tucked up," but full of work. The weight they carried was fully 16 stone.

The dragoons are mounted on a larger horse; but over 15·1 they are "leggy," hind legs far behind, "cat-hammed," and flat-sided. There are exceptions, of course, but this is the general tendency. The artillery, again, have even a worse class. Their horses are still taller, more leggy, and long backed. They look very different to the little round Persian horse found in our artillery in Bombay, and, I should think, most unsuited for heavy draught. It is as if we were to put our hussar horses to pull 16-pr. guns. Whether the country will ever produce horses fit for such heavy draught is, I think, exceedingly improbable; but for light draught, such as park phaetons, match pairs, the Hungarian horses, from their action, breeding, and activity, answer admirably.

The export of horses reaches, in some years, as many as 30,000, and remounts for the light cavalry are obtained in Hungary for the French, Italian, Turkish, and Belgian armies.

The staple forage of the country for horses is oats and hay, but amongst the peasantry little more than grass and hay is given, with perhaps a little Indian corn when in strong work.

As regards diseases, the well-bred stock, as with us, suffer from chest affections, and many foals die from these causes. Occasional epizoötics of influenza also ravage the country, and I heard that a good deal of glanders was imported on the termination of the Russo-Turkish war. As a rule, in the streets of Pesth, the ordinary working horses are singularly free from lameness, although the streets are paved, and they take a delight in driving fast. The same remark applies to the tramcar horses. The cars are of the usual size, and the horses certainly look too small for their work, but they seem in good condition, and not at all distressed. All the horses have good sound feet, the large, flat, thin feet being unknown; and certainly, from what I saw, I could not say that the Hungarian horses are vicious. On the contrary, they are brought up by hand almost, and appear tractable and docile. Castration is generally adopted.

To sum up, then, in a few words. I think that for light cavalry, riding not over 16 to 17 stone, the well-selected Hungarian horse would answer the purpose as well as any in the world, and by very great exertions, perhaps, a certain number might be obtained fit for medium cavalry; but for heavy cavalry and artillery, or for transport purposes, he is totally unsuited, from want of size—that is, thickness through, and weight.

For the service of the cavalry in India the Hungarian horse would answer admirably, and should such a corps as that of mounted infantry ever be organised, no better remounts could possibly be found. The ponies would answer for packsaddle draught; they are very plentiful and cheap; but I would much prefer a mule of the same size, such as is found in Asia Minor and Persia. Mule-breeding does not seem to have attracted much attention in Hungary.

I may here conclude with a few words regarding the 350 remounts which we purchased in Pesth for this Government. The horses were collected by Jew dealers, acting under the direction of the "Society for the Promotion of Horse-breeding and trading," a society founded by influential noblemen and landed proprietors, and encouraged and fostered by the Hungarian Government, so as to obtain a profitable outlet for this, one of the principal products of the country. To enable us to procure the number required, some 700 to 800 horses were brought in from all parts of the country, but principally from the east, north-east, and south-east. The rejections were principally for being too small and light, too young—under 4, too tall and leggy some few were big and coarse—15·3 to 16 hands; a large number were rejected for having bad hocks, others for narrow chests or long backs. The majority selected are Anglo-Arab, the chestnuts are of the Gidran caste, but in the whole the English blood predominates. The price given was 40*l.*, delivered in London. The same class of horse could be delivered in Trieste or Fiume for probably 30*l.* to 35*l.*

I cannot conclude this report without stating how much I was assisted by the Hungarian authorities, in order that I might see what was to be seen, and in furnishing me readily with all and every information I required, with the greatest courtesy and willingness. And I was much indebted to Mr. F. Stockinger, Secretary to the Minister of Commerce, for his invaluable aid, in the absence of an interpreter, during the whole of my journeys through the country. His services were placed entirely at the disposal of the Committee for purchasing the remounts, and in every way he rendered us the greatest assistance; and I should be very glad if some small recognition of his valuable services were forwarded to him by Her Majesty's Government, as he thoroughly deserves some thanks for his assistance as an interpreter, as well as for the general information regarding the horse supply of the country, which he so readily afforded.

XXV.—*Report on the Cattle Disease in the Island of Cyprus.* By F. Charles Heidenstam, M.D., District Medical Officer for Larnaca, Chief Inspector of Cattle Disease.

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The cattle-plague first showed itself at Larnaca on Dec. 4th, 1879, in the khan or public stable of Messrs. Demetrion Brothers. I heard of it by mere chance on December 8th, through a report that was circulating in the town to the effect that the cattle of Messrs. Demetrion, consisting of five fine yoke of oxen and cows, were all sick.

It was generally believed that they had been poisoned, and some persons went even so far as to affirm that the illness was due to the influence of the evil eye (witchcraft).

I visited the premises where the cattle were standing on December 8th, and found that one animal had already died and had disappeared. Nine animals were still in the stable sick, and these I subjected to a careful examination. It required very little penetration to see that the supposed poisoned animals were suffering from cattle-plague, and I at once put the khan under a guard of military police, and reported all the circumstances of the case to the District Commissioner, who did everything in his power to arrest the progress of the epidemic. There was imminent danger of the disease spreading unless it could be stamped out without a moment's delay, and my first suggestion was to have all the animals slaughtered there and then. Unfortunately, circumstances over which we had no control prevented us putting this measure into execution. There existed no authority at that time for such a proceeding, and our endeavours to persuade the owners to have the beasts killed themselves failed. They absolutely refused to listen to us, in the firm belief that cattle-plague was a perfect farce, and that several of the animals, if not all, would recover. The only thing we could do under these circumstances was to have the stable strictly guarded, and this was done. No animals of any kind were allowed to leave it, and the greatest care was taken to prevent the disease spreading beyond it. It is my firm belief that the measures we adopted were thoroughly effectual, and that the harm was done before I received information of the outbreak of the disease,—the khan in question, being a public stable, frequented daily by peasantry with their oxen from the surrounding villages.

On December 15th, a few days after, all Demetrion's cattle had died, with the exception of a cow that was ultimately saved, and of which I shall have occasion to speak in another place. I ascertained that a bullock was sick in the Turkish quarter of the town, and in quite a different neighbourhood to that in which stands Demetrion's khan. On visiting the stable I found that one of a yoke of oxen, belonging to a certain Mehemet, had just been attacked by the disease. On making inquiries as to how it caught it, I was told that Mehemet, being out with his cart and oxen on the evening of December 7th, passed by Demetrion's khan, and was asked by one of the brothers to remove the carcass of a cow outside the town, which he did. This led me to inquire what other persons with cattle had been in the habit of frequenting the khan. Several were mentioned to me, but two only had been to the khan after the disease broke out there. These were, first, the servants of Messrs. Henry S. King and Co., whose bullocks were stabled on the premises of Mr. M'Laughlan, of Larnaca and Tricomo, and who frequently went to Demetrion's khan with the cart to fetch straw; second, Hadji Taulli of Livadia, a small village four miles from Larnaca, whose bullocks were engaged in carrying stone to Demetrion's khan. A third person, named Adam Simeon, of Ormidia, had visited the khan on more than one occasion since the disease had broken out there, for the purpose of attending the animals which, as I mentioned above, were supposed to be under the influence of the evil eye, an influence which he was supposed to be able to dispel. On these occasions he had left his bullock cart standing at the gate of the khan.

My attention was at once directed to the above-named persons.

The yoke of oxen belonging to Messrs. Henry S. King and Co., which were standing in the stable of Mr. McLaughlan, died in December 1879, and were buried in the yard.

On December 22nd, at Livadia, Hadji Toulli, who owned sixteen animals, had lost two, and had nine ill; while three other animals, belonging to the same village, which had come in contact with those of Hadji Toulli, were also sick.

On the same date, at Ormidia, a small village in the Famagusta district, about three hours from Larnaca, the two animals belonging to Adam Simeon had died, as had also one belonging to his brother, while several others in the same village were ill.

With a view to arresting the progress of the disease, the infected villages were at once placed in quarantine, and no animals were allowed either to enter or leave them. Orders were despatched from Nicosia, to the authorities all over the island, to keep a strict watch for the outbreak or existence of any unusual kind of malady among cattle, and in the event of the disease making its appearance they were to give immediate notice of the same to the Chief Secretary to Government.

The result of these measures was that diseases among cattle were reported as existing in a great many villages in different parts of the island. His Excellency the High Commissioner was then pleased to give the orders to visit and inspect all the places where cattle-plague was supposed to have broken out; and Messrs. Commeline and Parsons, of the Forest Department, were appointed to assist me in this task.

I personally inspected almost the whole island, and found that the reports of the disease having shown itself in so many different places were the result of panic, the peasantry imagining that every animal that died or fell ill had caught the plague. Many animals had died, and many others were suffering from the effects of the exceptionally severe winter, and the scarcity of proper food, caused by the bad harvests of the two previous years.

At this time the disease only existed at Nisso and Palæorotissa, in the Nicosia district; at Tricomo and Ormidia, in the Famagusta district; at Aya Phylaxis, in the Limassol district; and at Larnaca and Livadia, in the Larnaca district.

The disease is believed to have been brought to Nisso, a small village belonging to Mr. Richard Mattei, on January 1st, by a pair of bullocks which went to Larnaca to fetch straw clandestinely. The bullocks of Mr. Mattei, in Larnaca, had been previously attacked by the disease, his stables being close to those used by Messrs. Henry S. King and Co.

The disease broke out in Palæorotissa through cattle brought there by Mr. Achilles Liassides, whose stables in Larnaca are almost opposite those used by Messrs. Henry S. King and Co.; and it seems that the yoke of oxen belonging to the latter were in the habit of drinking in Mr. Liassides' yard. So soon as the animals belonging to Mr. Liassides showed signs of sickness, he sent them, at night-time, to Nicosia; but finding some difficulty in entering the town, he had them left at Palæorotissa.

The disease broke out at Tricomo on December 26th, in the stables of Mr. McLaughlan, where it was brought by two of his bullocks which had been sent to Larnaca to fetch timber, and had remained one night in his stables there, the same as were occupied by the animals of Messrs. Henry S. King and Co.

The disease was brought to Aya Phylaxis, in the Limassol district, by two bullocks that were secretly driven there from Larnaca by Aradipiot cattle-dealers for the use of the troops at Polymedia. They remained only one night at Aya Phylaxis, in the stables of Christofi Kiriacon. The disease first showed itself there on December 26th.

So soon as it was found that the malady had spread to other parts of the island, through the non-observance of the orders that had been given respecting it, the following ordinance and public notice were issued by the Government, the latter being posted in the Greek and Turkish languages, in all the towns and villages of Cyprus:

Cyprus. *No.* I.—1880.

AN ORDINANCE

ENACTED by the HIGH COMMISSIONER and COMMANDER-IN-CHIEF of the ISLAND OF CYPRUS, under authority of an ORDER by the QUEEN in COUNCIL.

"To prevent the spreading of Contagious or Infectious Diseases among Animals."

Preamble.—WHEREAS by an Order of Her Majesty in Council, given at her Court at Balmoral, on the 14th day of September, 1878, it is declared to be lawful for the High Commissioner in and over the Island of Cyprus in cases of emergency to make and proclaim from time to time as therein mentioned ordinances for the good government of the Island: and whereas animal diseases of a highly infectious and contagious character have appeared in the Island, and the emergency of speedy legislative authority for providing means for the extirpation of such diseases exists.

Now therefore I, Robert Biddulph, High Commissioner and Commander-in-Chief of the Island of Cyprus, do by virtue and authority of the power in such behalf vested in me by the said Order in Council enact as follows:—

1. The High Commissioner shall have power and authority from time to time and at all times to notify in such manner as he may think fit any district or area or place within any area to be a place infected with animal disease.

2. The High Commissioner may also from time to time make such general or special orders as he thinks fit for the following purposes or any of them :—

(*a*) For the slaughter of any animal within an infected district, place, or area;

(*b*) For prohibiting or regulating the movement of animals in, or out of an infected district, place, or area;

(*c*) For prescribing and regulating the isolation or separation of animals being in an infected district, place, or area;

(*d*) For prohibiting or regulating the removal of carcasses, fodder, litter, dung or other things into, in or out of an infected district, place, or area;

(*e*) For prescribing and regulating the destruction, burial, disposal or treatment of carcasses, fodder, litter, dung, or other things being in an infected district, place or area, or removed thereout;

(*f*) For prescribing and regulating the cleansing and disinfecting of infected places and areas or parts thereof;

(*g*) For prohibiting or regulating within any infected district, place or area, the placing or keeping of animals on common or unenclosed lands, or in fields or other places insufficiently fenced, or on the sides of highways;

(*h*) For prohibiting or regulating the holding of markets, sales, or fairs of animals in public or private places where animals may be exposed for sale;

(*i*) For prohibiting or regulating the carrying, leading, or driving of animals on highways or thoroughfares or elsewhere;

(*j*) For prohibiting or regulating the moving, driving, sending or carrying of animals or of dung or other things likely to spread disease;

(*k*) For prohibiting the landing from vessels of any animals, carcasses, horns, hides, bones, fodder, litter, dung or other thing brought from any foreign country or inland port;

(*l*) Generally for the purpose of in any way preventing the introduction into this Island or the spreading therein of any contagious or infectious disease affecting animals;

(*m*) For the appointment, pay, and regulation of the duties of persons to be charged with the execution of any provisions or orders made by virtue of this Ordinance.

3. The High Commissioner shall have power and authority from time to time and at any time to notify in such manner as he may think fit any district or area or place within any area as being no longer infected, and thereupon, save as otherwise by such notification provided, for any general or special order that may have been given under the provisions of this Ordinance shall so far as it affects any such district or area or place within any area cease to have effect.

4. The High Commissioner may from time to time and at all times by any writing under his hand depute to any Civil Commissioner, Assistant Civil Commissioner, Commandant or Local Commandant, or other officer of police, or other person or persons designated in such writing, all or any one or more of the powers and authorities vested in him by this Ordinance.

5. Every person having in his possession or under his charge an animal that may be reasonably supposed to be affected with any contagious disease shall, as far as practicable, keep such separate from animals not so affected, and shall with all practicable speed give notice of the fact of the animal being

so affected to the Commissioner or other authority of the district wherein the animal so affected is; and if without lawful excuse, proof whereof shall lie on him, he fails to keep the animal so affected or supposed to be, separate from all others not affected, or to give such notice as is hereinbefore required to be given, he shall be liable to a fine not exceeding 5*l.*, or to be imprisoned for any term not exceeding one month, and with or without hard labour, and it shall be lawful for the Commissioner in his discretion to inflict such fine or imprisonment.

6. Any contravention of the orders or regulations issued under the authority of this Ordinance, or any obstruction to an officer or person appointed to execute the same, may be punished by fine for a first offence not exceeding 5*l.*, for the second offence not exceeding 10*l.*, and for a third offence not exceeding 20*l.*, which fines may be adjudged by any court of competent jurisdiction, and recoverable under the provisions of "The Fines and Penalties Recovery Ordinance, 1879;" and any portion of any fine adjudged by any Court may by such Court be awarded to the person or persons upon whose information the conviction is obtained.

7. In this Ordinance animals mean bulls, cows, oxen, heifers, calves, camels, horses, mules, asses, sheep, goats and swine.

8. All acts done before the making of this Ordinance for the purpose or with the intention of staying infection or contagion of disease to animals shall if such acts have been done by authority of the High Commissioner, or have been or may be sanctioned or ratified by him, be considered as having been done under authority of this Ordinance.

9. This Ordinance may for all purposes be cited as "The Contagious Diseases Animals Ordinance, 1880," and shall have effect only for the period of six calendar months from the date thereof.

Given at Nicosia this seventh day of February, 1880.

(Signed) Robert Biddulph,
High Commissioner.

V. R.

PUBLIC NOTICE.

1.—The High Commissioner under the power and authority vested in him by "The Contagious Diseases (Animals) Ordinance, 1880," has proclaimed the several places or areas in the schedule hereto mentioned as places and areas infected with animal disease.

2.—The High Commissioner, under the power and authority as aforesaid, has also ordered as follows:—

(*a*) Every diseased animal within any of such districts or areas which may be considered incurable, or dangerous as a medium of infection to other animals, shall be slaughtered at and according to the direction of the Commissioner of the district, or of the Chief Inspector of Cattle Disease.

(*b*) The moving of any animal into or out of the several scheduled places or areas is hereby prohibited.

(*c*) All diseased animals within any of such scheduled districts shall be isolated and separated from any animals other than such as are diseased.

(*d*) No carcass, fodder, litter, dung, or other material which in the opinion of the said Commissioner or said Inspector shall be considered capable of conveying infection shall be moved into or out of any of the said scheduled places or areas.

(*e*) All such carcasses, fodder, litter, dung or other material shall be destroyed as the said Commissioner or the said Inspector may direct.

(*f*) All stables, buildings, sheds, pens, places, and areas in which any diseased animal shall have been during its disease or immediately prior thereto, shall be cleansed and purified as the said Commissioner or Inspector may direct.

(*g*) No animal shall be allowed at large on any highway, common, or unenclosed land within any of the said scheduled places or areas save by the written authority of the said Inspector or Commissioner.

(*h*) No markets, fairs, or public exposure for sale of any animal shall be permitted in any of the said scheduled places or areas without the written authority of the said Commissioner or Inspector.

(*i*) The carrying, leading, or driving of animals on any highway or thoroughfare in the said scheduled places or areas without such authority as aforesaid is prohibited.

3.—Any contravention of the foregoing orders, or any obstruction to any officer or person concerned in the carrying out thereof, is punishable under the provisions of the above-mentioned Ordinance by a fine for the first offence not exceeding 5*l*., for the second offence not exceeding 10*l*., and for the third offence not exceeding 20*l*., any portion of which may be awarded to the person or persons giving information of the offence.

4.—The High Commissioner has appointed Dr. Heïdenstam, Civil Surgeon of Larnaca, to be Chief Inspector of Cattle Disease.

5.—Commissioners of Districts are to pay such portions of fines as may be recovered for any contravention of the above orders or of the said Ordinance, and as may not be awarded to the informer, into the District Treasury. They shall also transmit weekly to the Chief Secretary to the Government, for the information of the High Commissioner, an account of all such fines, and of the disposal thereof.

6.—The word "animals" occurring in the foregoing orders until further notice is applicable only to bulls, cows, oxen and calves.

Published by command.

(Signed) CLAUDE DELAVAL COBHAM,
Acting Chief Secretary to Government.

February 7th, 1880.

It was not merely difficult, but often utterly impossible, to combat the indifference shown by the peasantry for the official regulations. In many instances this indifference was coupled with culpable disobedience to the orders given by the authorities in the interest of the community at large. The ordinary peasants, through ignorance and stupidity, which was even greater in Turkish than in Christian villages, would take no steps to check the progress of the malady, many Mohammedans believing that to attempt to avoid sickness or any kind of calamity is perfectly useless, while the more fanatical consider such an act contrary to their religious ideas.

While struggling with the stupidity of the ordinary peasants, it was necessary to combat the cupidity of the cattle-dealers, who, setting the ordinance and the regulations that were made under it at defiance, purchased cattle in places infected with disease, and where the peasantry, fearing to lose their animals by sickness, were willing to dispose of them for anything they could get. These beasts were driven secretly to villages that were free from the malady, where they were sold, and where they carried the germ of the disease with them.

It would take me beyond the proposed limits of this report to describe how the disease gradually spread to different parts of the island. In some instances it made its way through negligence, but in the majority of cases its progress was traced to an insatiable desire for gain, and an utter disregard for the regulations laid down by the authorities. Offenders against the ordinance were, however, nearly always discovered, and were prosecuted and punished, but without, unfortunately, deterring others from following their example, the profits which they made by their illicit dealings being so large.

The thoroughly effectual method for stamping out the disease by slaughtering all affected animals, as well as those suspected of having had any communication with them, could not, unfortunately, be adopted in its entirety at that time. His Excellency the High Commissioner, after considering the matter, came to the very just conclusion that, if a measure of that kind was put in vigour, it would rather help to propagate the malady than to check it. It would have been impossible to kill healthy animals on the bare suspicion of their having communicated with unhealthy ones, without giving their owners some kind of compensation, and it was feared, with reason, that the peasants who were anxious to get rid of their cattle on account of the high price of forage would have brought them in contact with unhealthy animals, or would have sought to prove that they had been in contact with these, in order to have their own slaughtered and receive compensation for them.

Under these circumstances orders were given to slaughter only sick animals. An inspector was placed in charge of each infected district, and so soon as the disease appeared in a village over which he had control, he informed me and the Commissioner of the district in which the village was situated, who immediately sent a guard of zaptiehs there; and, in accordance with the power that his Excellency was pleased to grant me under date of January 28th, 1880, the village was placed in quarantine pending its publication in the list of infected places in the 'Cyprus Gazette.' All movement of cattle in or out of their stables or yards was prohibited; all dogs were ordered to be chained up, both in the village where the disease had broken out and in the surrounding ones; and two stables in the most isolated part of the village were set apart to serve as hospitals. All animals showing signs of being affected by the disease were located in the first stable, while all apparently healthy animals that had been in contact with unhealthy ones, or were suspected of having done so, were confined to the other. Both these stables were locked, and the key placed in charge of the zaptieh on guard, who alone had any communication with the suspected cattle. Each time the inspector visited the village, which was almost daily, all the animals in the first stable were slaughtered and deeply buried in quicklime, along with their hides and dung. The stable or premises from which the sick animals were taken when transferred to the hospital were thoroughly cleaned out, the walls whitewashed, and the dung and rubbish buried in quicklime, and no animal was allowed to enter the place for twenty days. All dogs found loose, whether belonging to the infected village or others, were shot.

I am certain that these measures would have proved thoroughly effectual in stopping the progress of the disease, but, unfortunately, so soon as it was mastered in one locality it appeared in quite a different one; and it was ultimately discovered that it had been brought there by cattle driven from villages that had been infected with the disease, but which were at that time quite free from it.

As attempts were frequently made to drive animals from unhealthy districts to healthy ones, mounted zaptiehs were appointed to patrol the frontiers, and a list of the cattle belonging to the various villages was obtained from the head-men of the same. These lists were checked by the inspectors each time they visited the villages, and the head-men were held responsible for any missing cattle.

One of my first cares on discovering the disease in Demetrion's khan was to ascertain how it reached the island. I may mention here that this is the first time Cyprus has been visited by cattle-plague. Indeed, with the exception of small-pox among sheep and goats, which was brought here by animals imported from Caramania in 1873, and mange on camels, brought from Mersyna in 1871, this is the only time that a contagious disease of any kind among animals has visited the island. There has not even been a single case of hydrophobia here.

It was generally supposed that the cattle-disease was brought to Cyprus either by cattle imported from Russia by the contractor for the supply of meat to the troops at Polymedia, or by chopped straw, which at that time was imported from Syria in large quantities to meet the daily increasing demand for forage. I carefully examined these two theories, with the following result.

The contractor Rees had been bringing cattle to the island for some time previous to the outbreak of the disease, without any of the animals having ever shown signs of sickness. With reference to the last lot that he landed at Larnaca previous to the discovery of the existence of the malady, I obtained the following information, substantiated by proof.

Thirty animals left Odessa, accompanied by a certificate from the official veterinary surgeon of that port, to the effect that no cattle-disease existed there at the time they were embarked, and that they went on board the steamer bound for Constantinople in a perfectly healthy condition. The same number reached Constantinople, and remained five days in quarantine there, subject to inspection. Mr. Vitalis, the sanitary officer, certified that these animals were shipped from the Turkish capital on October 24th, 1879, and that they were all well at the moment of their departure. Dr. Borg, the sanitary doctor at Smyrna, certified that thirty animals arrived there on October 26th; that two were disembarked, and that twenty-eight continued their voyage to Cyprus, in a healthy state. On their arrival here on October 29th, 1879, by the steam-ship *Junon*, of the Austro-Hungarian Lloyd's line, I visited them personally on board the steamer, and found twenty-nine animals, one cow having calved during the voyage. They all appeared healthy, but I nevertheless ordered them to be placed in quarantine for observation. In landing them from the steamer, two animals were drowned, and the remaining twenty-seven were placed in quarantine for five days and watched. On November 5th, twenty-five of these left Larnaca for Limassol, and a cow and calf intended for Nicosia remained here.

Immediately the disease was discovered in Demetrion's khan, the Commissioner of Larnaca, acting on my suggestion, telegraphed to the Commissioner of Limassol, and the twenty-five animals which had left here for Limassol were placed in quarantine and watched, while the cow and calf that had remained here were also isolated. After remaining thus for twenty days, the whole of the animals were found perfectly healthy, and set free.

These undeniable facts lead me to suppose that if any of these animals suffered from cattle-plague, it would most certainly have shown itself during the fifty-one days that had elapsed since they left Odessa, and that some, if not all, of them would have died.

The idea that the disease was brought to the island by chopped straw seems to me highly improbable. The imported straw, almost as soon as it was landed, was despatched to various parts of the island; and, had it been the means of communicating the disease, cattle-plague would have shown itself in several places at the same time, instead of in one particular stable—that is to say, the khan of Messrs. Demetrion Brothers, into which no foreign straw was introduced, as the owners had a large supply of the native article on the premises.

Previous to the discovery of the cattle-plague in Cyprus, the disease had been raging for a considerable time in different parts of Syria, and although no official notification of its existence there had as yet reached the island, private information respecting its ravages was not wanting. No cattle, however, had arrived here from the opposite coast for several months; but on November 26th, 1879, the British steam-ship *Fitzmaurice*, carrying cattle from Jaffa, where the disease was known to exist, to Alexandria, anchored in the roadstead of Larnaca and disembarked some goods. The captain of this steamer asked permission of the Captain of the Port to land a bullock which had broken its leg, in order that he might have it slaughtered for butcher's meat. The matter was referred to me as sanitary officer, and I positively refused to give the required permission. I subsequently heard that a butcher in this place, named Manoli, went on board the steamer and slaughtered the animal for the use of the crew. Its hide was brought on shore by the butcher, who sold it to Demetrion Brothers, and it was, I believe, placed in their khan. It is my opinion that it was through this skin that the disease found its way to the island.

The animals which I have seen suffering from cattle-plague are not all attacked in exactly the same way, and this I attribute to the fact of the affection being slight or violent, as the case may be; but the diagnostic signs are invariably the same.

The period of incubation varies from eight to five days, and one of the first apparent symptoms is a loss of appetite. This is accompanied by an increased rapidity in respiration, which reaches as much as 74, while the temperature of the body attains 108° 6′, and the pulsation 128. The animal seems uneasy; it stretches out its neck as if seeking for breath; its ears hang downwards, and in some instances it is deaf; the head and breath are hot, the ears and limbs quite cold.

A running of a watery nature commences about the second day from the eyes and nose, changing in the latter period of the disease to a purulent secretion. I should, however, mention that I have known of cattle having a running at the eyes and nose, which, it was stated, were attacked by cattle-plague, while it was afterwards proved that they were merely suffering from catarrh.

On the tongue and on the inside of the lips there is an epithelical deposit of a yellowish colour, which has a peculiar fetid smell. I noticed also in some cases that the mouth and the membrane round the nasal orifices were ulcerated. About the fourth day the animal is generally unable to move, which indicates that it is suffering from excessive weakness. It refuses all food, and when offered water it endeavours to dri but seems unable to swallow. A constant diarrhœa of fetid greenish matter sets in, and the urine is scarce and highly coloured. These symptoms increase in violence up to the fifth or sixth day, when the animal expires completely exhausted.

I have noticed that in some cases there are signs of amelioration about the third or fourth day; these, however, soon disappear, and the animal relapses into its original condition.

Death generally occurs about the fourth or fifth day, but it sometimes happens on the third, and I have seen rare cases in which the disease assumed a chronic aspect, lasting for two or three weeks. Favourable cases are indicated by a gradual decrease of alarming symptoms, and a return of appetite. I have noticed on all animals that have got safely through the disease and are restored to health, a cutaneous irruption on various parts of the body. I have seen no animals that have once had the disease attacked a second time. From several experiments that I have made, and of which I give the account of two below, I feel convinced that the disease is transmitted by animals that have been restored to health, up to the eighteenth day after the disease has left them.

Example No. 1.—The cow, which was the only animal saved out of the five yoke of cattle in Demetrion's khan, suffered severely from the disease. On the fifth day she dropped a nine months' calf, and then gradually got better. On the twelfth day she was completely restored to health, with the exception of the cutaneous irruption on the body which I have mentioned above. She was then isolated, and when she had been alone for ten days I was asked by the owners if I would allow them to put another animal with her, their idea still being that their cattle had been poisoned. Being anxious to convince them of the contrary, and curious to make the experiment, I had the cow placed in a clean stable, and, after carefully examining her proposed companion, and finding it a perfectly healthy animal, I put the two together. Four days afterwards the new beast began to show signs of sickness, and on the eighth day it died. The cow was again isolated, and after being alone for a fortnight, the irruption being then perfectly cured, another animal was placed with her, and it is still alive.

Experiment No. 2.—At Apalestra Chiflik (farm), a small calf about twelve months old, which had had a severe attack of the disease, was the only animal saved out of sixteen head of cattle. After getting through the illness, the irruption I have mentioned broke out in a rather violent form. The calf, on the seventeenth day after its recovery from the disease, was taken secretly by the owner to Kouklia, about fifteen miles distant, and placed among the cattle of Mr. Richard Mattei. Four days afterwards several of the latter were attacked, and the disease took a firm footing in the village.

Many suggestions were made respecting the treatment of this disease, and many kinds of medicines were tried, by way of experiment, on animals afflicted with the malady; but up to the present everything has failed in producing any practical result. *Ferri sulphas* and *acid. sulphuric.*, with a little laudanum, seemed at times to have some effect; and the peasants themselves had great faith in vinegar, a small cupful of which they administered internally every morning, while the eyes, nostrils, and mouth of the affected animal were washed with it several times a day.

After very careful consideration of the subject, and an experience of cattle-plague extending over a period of six months, during which I have had numerous opportunities of studying the disease in its different phases in various parts of the island, I have come to the decided conclusion that no cure of any kind ought to be attempted, but that immediately an animal shows the slightest sign of being affected with the malady, it should be slaughtered, as by trying to save one animal a whole locality is frequently infected with disease.

I have reason to believe that inoculation may possibly prove in the course of time a successful preventive against the disease, but I propose speaking of this kind of treatment at a future date, when I hope to have obtained more positive results from experiments I have already made, and others that are now in progress.

I have examined the bodies of over one hundred animals after death, and have found almost invariably that the interior of the carcasses presented the same appearance. The inside of the mouth and pharynx were of a darkish red colour. The tongue was flabby, and covered with a yellowish exudation. I saw nothing remarkable about the three first stomachs, but on the fourth I noticed several deep red blotches, and in some cases it was spotted with small ulcers, which forcibly reminded me of those so common in cases of catarrhal inflammation of the human stomach. I was surprised to find the small intestines generally speaking free from disease. The bronchial mucous membrane was frequently injected and covered with tough mucus. The lungs were congested and swollen, and their interlobular tissue was distended with air. The heart was relaxed and discoloured. The brain appeared to be unaffected, although it was more than usually injected with blood, and the meninges were of a reddish colour. I noticed no particular change about any of the other parts, except that the body was generally more red than is customary, as were also the urinary and generative organs.

TABLE showing the DEATH-RATE of the DISEASE, up to MAY 31st, 1880, in the NICOSIA DISTRICT.

NAME OF TOWN, VILLAGE, OR FARM.	Total Number of Stock.	Number of Animals Attacked.	Number of Animals that died of Disease.	Number of Diseased Animals Slaughtered.	Number of Healthy Animals Slaughtered.	Number of Animals that recovered.	Total Loss.	Date of First Outbreak.	Date of Last Death.	OBSERVATIONS.
Palæorotissa ..	122	41	39	..	..	2	39	3/1/80	1/3/80	The bullocks employed in the transport service of Liassides were there at the time.
Aija Marina ..	103	23	20	..	..	3	20	27/1/80	6/3/80	
Nisso	12	10	10	..	..	..	10	26/1/80	11/2/80	
Dali	157	72	61	4	..	7	65	4/2/80	23/3/80	A diseased animal was brought here from Kouklia on 1/4/80 and slaughtered.
Kythrea	185	11	9	2	..	..	11	26/3/80	12/4/80	
Angoulame ..	36	26	10	16	2	..	28	2/5/80	26/5/80	
Kato Zodia ..	76	2	..	2	1	..	3	9/5/80	11/5/80	
Linou	123	12	7	5	1	..	13	7/5/80	21/5/80	
Philassou	68	7	4	3	1	..	8	17/5/80	29/5/80	
Korakou	108	14	7	7	1	..	15	10/5/80	23/5/80	
Total ..	..	218	167	39	6	12	212	3/1/80	29/5/80	First outbreak and last death in district.

TABLE showing the DEATH-RATE of the DISEASE, up to MAY 31st, 1880, in the FAMAGUSTA DISTRICT.

NAME OF TOWN, VILLAGE, OR FARM.	Total Number of Stock.	Total Number of Animals Attacked.	Number of Animals that died of the Disease.	Number of Diseased Animals Slaughtered.	Number of Healthy Animals Slaughtered.	Number of Animals recovered.	Total Loss.	Date of First Outbreak.	Date of Last Attack.	OBSERVATIONS.
Tricomo	238	195	182	4	..	9	186	29/12/79	23/2/80	
Apalestra Chiflik	16	16	11	4	..	1	15	4/ 2/80	25/2/80	The surviving animal—a calf—was taken to Kouklia and lived; but gave the disease to that village.
Kouklia	75	43	26	13	..	4	39	12/ 3/80	27/4/80	
Stilous	72	19	16	1	..	2	17	17/ 3/80	7/5/80	
Gaïdoura	103	19	9	7	..	3	16	29/ 3/80	2/5/80	
Praskiou	395	2	1	1	..	..	2	7/ 4/80	10/4/80	
Lower Mandres	70	9	6	2	..	1	8	23/ 3/80	21/4/80	
Perga	183	58	46	9	..	3	55	1/ 3/80	3/5/80	
Scinda	65	31	25	4	..	2	29	28/ 2/80	30/4/80	The disease broke out twice here.
Vatili	263	84	62	14	..	8	76	2/ 3/80	30/4/80	
Arsos	64	17	14	2	..	1	16	7/ 3/80	1/5/80	
Coutea	105	9	7	2	..	..	9	30/ 2/80	18/4/80	
Lefkoniko ..	875	3	1	2	..	..	3	10/ 4/80	20/4/80	
Angostina ..	172	60	46	8	..	6	54	26/ 3/80	21/4/80	
Afghasida	19	1	..	1	..	..	1	3/ 4/80	6/4/80	
Timbou	67	8	5	3	..	..	8	28/ 3/80	12/4/80	
Ipsilados	107	21	15	4	..	2	19	8/ 3/80	15/4/80	
Tsados	102	41	34	5	..	2	39	2/ 4/80	3/5/80	
Limnia	112	25	19	5	..	1	24	25/ 4/80	21/5/80	
St. George ..	61	2	1	1	..	..	2	10/ 5/80	27/5/80	
Total ..	..	663	526	92	..	45	618	29/12/79	27/5/80	First outbreak and last attack in district.

TABLE showing the DEATH-RATE of the DISEASE, up to MAY 31st, 1880, in the NICOSIA DISTRICT.

NAME OF TOWN, VILLAGE, OR FARM.	Total Number of Stock.	Number of Animals Attacked.	Number of Animals that died of Disease.	Number of Diseased Animals Slaughtered.	Number of Healthy Animals Slaughtered.	Number of Animals that recovered.	Total Loss.	Date of First Outbreak.	Date of Last Death.	OBSERVATIONS.
Palæorotissa	122	41	39	..	..	2	39	3/1/80	1/3/80	The bullocks employed in the transport service of Liassides were there at the time.
Aija Marina ..	103	23	20	..	..	3	20	27/1/80	6/3/80	
Nisso	12	10	10	..	..	..	10	26/1/80	11/2/80	
Dali	157	72	61	4	..	7	65	4/2/80	23/3/80	A diseased animal was brought here from Kouklia on 1/4/80 and slaughtered.
Kythrea	185	11	9	2	..	..	11	26/3/80	12/4/80	
Angoulame ..	36	26	10	16	2	..	28	2/5/80	26/5/80	
Kato Zodia ..	76	2	..	2	1	..	3	9/5/80	11/5/80	
Linou	123	12	7	5	1	..	13	7/5/80	21/5/80	
Philassou	68	7	4	3	1	..	8	17/5/80	29/5/80	
Korakou	108	14	7	7	1	..	15	10/5/80	23/5/80	
Total ..	..	218	167	39	6	12	212	3/1/80	29/5/80	First outbreak and last death in district.

TABLE showing the DEATH-RATE of the DISEASE, up to MAY 31st, 1880, in the FAMAGUSTA DISTRICT.

NAME OF TOWN, VILLAGE, OR FARM.	Total Number of Stock.	Total Number of Animals Attacked.	Number of Animals that died of the Disease.	Number of Diseased Animals Slaughtered.	Number of Healthy Animals Slaughtered.	Number of Animals recovered.	Total Loss.	Date of First Outbreak.	Date of Last Attack.	OBSERVATIONS.
Tricomo	238	195	182	4	..	9	186	29/12/79	23/2/80	
Apalestra Chiflik	16	16	11	4	..	1	15	4/ 2/80	25/2/80	The surviving animal—a calf—was taken to Kouklia and lived; but gave the disease to that village.
Kouklia	75	43	26	13	..	4	39	12/ 3/80	27/4/80	
Stilous	72	19	16	1	..	2	17	17/ 3/80	7/5/80	
Gaïdoura	103	19	9	7	..	3	16	29/ 3/80	2/5/80	
Praskiou	395	2	1	1	..	..	2	7/ 4/80	10/4/80	
Lower Mandres	70	9	6	2	..	1	8	23/ 3/80	21/4/80	
Perga	183	58	46	9	..	3	55	1/ 3/80	3/5/80	
Scinda	65	31	25	4	..	2	29	28/ 2/80	30/4/80	The disease broke out twice here.
Vatili	263	84	62	14	..	8	76	2/ 3/80	30/4/80	
Arsos	64	17	14	2	..	1	16	7/ 3/80	1/5/80	
Coutca	105	9	7	2	..	..	9	30/ 2/80	18/4/80	
Lefkoniko ..	875	3	1	2	..	..	3	10/ 4/80	20/4/80	
Angostina ..	172	60	46	8	..	6	54	26/ 3/80	21/4/80	
Afghasida	19	1	..	1	..	..	1	3/ 4/80	6/4/80	
Timbou	67	8	5	3	..	..	8	28/ 3/80	12/4/80	
Ipsilados	107	21	15	4	..	2	19	8/ 3/80	15/4/80	
Tsados	102	41	34	5	..	2	39	2/ 4/80	3/5/80	
Limnia	112	25	19	5	..	1	24	25/ 4/80	21/5/80	
St. George ..	61	2	1	1	..	..	2	10/ 5/80	27/5/80	
Total ..	..	663	526	92	..	45	618	29/12/79	27/5/80	First outbreak and last attack in district.

TABLE showing the DEATH-RATE of the DISEASE, up to MAY 31st, 1880, in the NICOSIA DISTRICT.

NAME OF TOWN, VILLAGE, OR FARM.	Total Number of Stock.	Number of Animals Attacked.	Number of Animals that died of Disease.	Number of Diseased Animals Slaughtered.	Number of Healthy Animals Slaughtered.	Number of Animals that recovered.	Total Loss.	Date of First Outbreak.	Date of Last Death.	OBSERVATIONS.
Palæorotissa	122	41	39	..	..	2	39	3/1/80	1/3/80	The bullocks employed in the transport service of Liassides were there at the time.
Aija Marina ..	103	23	20	..	..	3	20	27/1/80	6/3/80	
Nisso	12	10	10	..	..	..	10	26/1/80	11/2/80	
Dali	157	72	61	4	..	7	65	4/2/80	23/3/80	A diseased animal was brought here from Kouklia on 1/4/80 and slaughtered.
Kythrea	185	11	9	2	..	..	11	26/3/80	12/4/80	
Angoulame ..	36	26	10	16	2	..	28	2/5/80	26/5/80	
Kato Zodia ..	76	2	..	2	1	..	3	9/5/80	11/5/80	
Linou	123	12	7	5	1	..	13	7/5/80	21/5/80	
Philassou	68	7	4	3	1	..	8	17/5/80	29/5/80	
Korakou	108	14	7	7	1	..	15	10/5/80	28/5/80	
Total ..	..	218	167	39	6	12	212	3/1/80	20/5/80	First outbreak and last death in district.

TABLE showing the DEATH-RATE of the DISEASE, up to MAY 31st, 1880, in the FAMAGUSTA DISTRICT.

NAME OF TOWN, VILLAGE, OR FARM.	Total Number of Stock.	Total Number of Animals Attacked.	Number of Animals that died of the Disease.	Number of Diseased Animals Slaughtered.	Number of Healthy Animals Slaughtered.	Number of Animals recovered.	Total Loss.	Date of First Outbreak.	Date of Last Attack.	OBSERVATIONS.
Tricomo	238	195	182	4	..	9	186	29/12/79	23/2/80	
Apalestra Chiflik	16	16	11	4	..	1	15	4/ 2/80	25/2/80	The surviving animal—a calf—was taken to Kouklia and lived; but gave the disease to that village.
Kouklia	75	43	26	13	..	4	39	12/ 3/80	27/4/80	
Stilous	72	19	16	1	..	2	17	17/ 3/80	7/5/80	
Gaïdoura	103	19	9	7	..	3	16	29/ 3/80	2/5/80	
Praskiou	395	2	1	1	..	..	2	7/ 4/80	10/4/80	
Lower Mandres	70	9	6	2	..	1	8	23/ 3/80	21/4/80	
Perga	183	58	46	9	..	3	55	1/ 3/80	3/5/80	
Scinda	65	31	25	4	..	2	29	28/ 2/80	30/4/80	The disease broke out twice here.
Vatili	263	84	62	14	..	8	76	2/ 3/80	30/4/80	
Arsos	64	17	14	2	..	1	16	7/ 3/80	1/5/80	
Coutca	105	9	7	2	..	..	9	30/ 2/80	18/4/80	
Lefkoniko ..	875	3	1	2	..	..	3	10/ 4/80	20/4/80	
Angostina ..	172	60	46	8	..	6	54	26/ 3/80	21/4/80	
Afghasida	19	1	..	1	..	..	1	3/ 4/80	6/4/80	
Timbou	67	8	5	3	..	..	8	28/ 3/80	12/4/80	
Ipsilados	107	21	15	4	..	2	19	8/ 3/80	15/4/80	
Tsados	102	41	34	5	..	2	39	2/ 4/80	3/5/80	
Limnia	112	25	19	5	..	1	24	25/ 4/80	21/5/80	
St. George ..	61	2	1	1	..	..	2	10/ 5/80	27/5/80	
Total ..	..	663	526	92	..	45	618	29/12/79	27/5/80	First outbreak and last attack in district.

TABLE showing the DEATH-RATE of the DISEASE, up to MAY 31st, 1880, in the LARNACA DISTRICT.

NAME OF TOWN, VILLAGE, OR FARM.	Total Number of Stock.	Number of Animals Attacked.	Number of Animals that died of the Disease.	Number of Diseased Animals Slaughtered.	Number of Healthy Animals Slaughtered.	Number of Animals that recovered.	Total Loss.	Date of First Outbreak.	Date of Last Death.	OBSERVATIONS.
Larnaca	273	101	92	2	..	7	94	4/12/79	25/2/80	A diseased animal was brought to Larnaca, and was slaughtered on 20/3/80.
Touzla	378	143	122	8	..	13	130	3/ 1/80	14/3/80	Two animals here were saved by treatment.
Livadia	151	83	76	3	..	4	79	18/12/79	28/2/80	
Kelia	39	18	15	..	..	3	15	14/ 1/80	24/2/80	
Pacha Chiflik ..	11	10	6	4	..	..	10	3/ 1/80	15/1/80	The surviving animal was taken to Larnaca and lived.
Blako Chiflik ..	8	8	7	..	..	..	8	1/ 1/80	16/1/80	
Tersephano ..	101	7	4	3	..	..	7	30/ 2/80	10/3/80	
Maroni	106	29	16	12	..	1	28	10/ 4/80	3/5/80	
Aija Theodoros	121	21	9	7	4	1	20	5/ 5/80	21/5/80	
Sirouktea ..	51	11	6	5	..	..	11	15/ 5/80	27/5/80	
Total ..	..	431	353	44	4	29	402	4/12/79	27/5/80	First outbreak and last attack in the district.

TABLE showing the DEATH-RATE of the DISEASE, up to MAY 31st, 1880, in the LIMASSOL DISTRICT.

NAME OF TOWN, VILLAGE, OR FARM.	Total Number of Stock.	Number of Animals Attacked.	Number of Animals that died of Disease.	Number of Diseased Animals Slaughtered.	Number of Animals that recovered.	Number of Healthy Animals Slaughtered.	Total Loss.	Date of First Outbreak.	Date of Last Attack.	OBSERVATIONS.
Aija Phylaxis ..	106	102	98	..	4	..	98	4/1/80	26/3/80	
Palodia	22	4	4	..	..	..	4	27/1/80	17/3/80	
Montayaka ..	44	30	28	..	2	..	28	1/3/80	30/4/80	
Vermasoya ..	40	7	6	..	1	..	6	16/3/80	28/4/80	
Total ..	212	143	136	..	7	..	136	4/1/80	30/4/80	First outbreak and last death in district.

TABLE showing the DEATH-RATE of the DISEASE, up to MAY 31st, 1880, in the PAPHO DISTRICT.

NAME OF TOWN, VILLAGE, OR FARM.	Total Number of Stock.	Number of Animals Attacked.	Number of Animals that died of Disease.	Number of Diseased Animals Slaughtered.	Number of Healthy Animals Slaughtered.	Number of Animals that recovered.	Date of First Outbreak.	Date of Last Death.	Total Loss.	OBSERVATIONS.
Sarama	68	36	30	4	..	2	5/5/80	26/5/80	34	
Lasso	36	16	7	8	..	1	10/5/80	28/5/80	15	
Fidi	109	2	..	2	..	..	22/5/80	26/5/80	2	
Anetion	98	4	..	4	..	..	21/5/80	22/5/80	4	
Oros	55	3	..	3	..	..	21/5/80	22/5/80	2	
Total ..	366	61	37	21	..	3	5/5/80*	28/5/80*	57	* First outbreak and last death in district.

TABLE showing the DEATH-RATE of the DISEASE, up to MAY 31st, 1880, in the KYRENIA DISTRICT.

NAME OF TOWN, FARM, OR VILLAGE.	Total Number of Stock.	Number of Animals Attacked.	Number of Animals that died of Disease.	Number of Diseased Animals Slaughtered.	Number of Healthy Animals Slaughtered.	Number of Animals that recovered.	Total Loss.	Date of First Outbreak.	Date of Last Death.	OBSERVATIONS.
Merton	67	23	21	..	..	2	21	1/3/80	30/4/80	
Thermia	45	1	1	..	..	..	1	2/4/80	6/4/80	
Total ..	112	24	22	..	..	2	22	1/3/80	30/4/80	First outbreak and last death in district.

TABLE showing the EFFECTS of the DISEASE in the various DISTRICTS of the ISLAND.

NAME OF DISTRICT.	Number of Animals Attacked.	Number of Animals that died of Disease.	Number of Diseased Animals Slaughtered.	Number of Healthy Animals Slaughtered.	Number of Animals that recovered.	Date of First Outbreak.	Date of Last Death.	Total Loss.	OBSERVATIONS.
Nicosia	218	167	39	6	12	3/ 1/80	29/5/80	212	
Famagusta ..	663	526	92	..	45	29/12/79	27/5/80	618	
Larnaca	431	353	44	4	29	4/12/79	27/5/80	402	
Limassol	143	136	..	..	7	4/ 1/80	30/4/80	136	
Papho	61	37	21	..	3	5/ 5/80	28/5/80	57	
Kyrenia	24	22	..	..	2	1/ 3/80	30/4/80	22	
Total ..	**1540**	**1241**	**196**	**10**	**98**	**4/12/79***	**29/5/80***	**1447**	*** First outbreak and last death prior to May 31st, 1880, in the island.**

XXVI.—*The Sources of Supply of the Manchester Fruit and Vegetable Markets.* By JOHN PAGE.*

THIS subject is indeed a comprehensive one. Time was when this market was dependent upon Cheshire and the Lancashire bank of the Mersey for its supplies of fresh vegetables and fruits; but since the abolition of duties, improved steam navigation, and the more complete development of the railway system, no spot upon the earth's surface appears sufficiently remote to deprive the teeming populations of these districts of its productions.

But whilst these changes have proved a blessing to the community generally, it will be said, probably, that they have tended to the injury of the native grower of many kinds of agricultural and horticultural produce. We know that that which is for the public good is oftentimes temporarily prejudicial to the interests of individuals. It is not the province of the writer of this article to point out any remedial measures that may suggest themselves; but he may be permitted to say that it seems pretty certain that the only change that can bring remunerative prices to the English grower—if they are not now so—lies between himself and the owner of the soil he cultivates. Diminished crops in this country, from whatever cause, no longer mean higher prices from the consumer. Abundance in any part of the world will flow into the scarcity of any other as surely as air rushes into a vacuum.

Other changes have also taken place. Ere the revolution in the sources of supply had begun, the growers supplying this market brought their goods and disposed of them personally, now the great bulk reaches us by railway. The number of carts laden with their owners' produce which arrived in the market on the night of Friday, the 8th of August, and before six o'clock on the morning of Saturday, the 9th, last year, was two hundred and thirty. Their contents would probably be about one-eighth of the total supply brought for the Saturday's market. Very few large growers now sell their own goods; they are generally consigned to salesmen who have permanent standings in the market, and who charge a commission of 5 per cent. upon the sale of all goods entrusted to them. This system has its advantages, and perhaps is not entirely free from occasional disadvantages. Doubtless the owner would frequently make more by his goods if he personally attended the sale of them, but then, to set against this, there is the time and money expended to enable him to do so, and, therefore, all things considered, he is induced to save himself much trouble and employ the salesman.

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* Extracted from a Prize Essay published by the Royal Manchester, Liverpool, and North Lancashire Agricultural Society, by permission of that Society.

In laying before the reader some of the chief sources of supply, I will begin with our own country.

In the first three months of the year vast quantities of flowering broccoli (erroneously called cauliflowers by many persons) are received from Cornwall; very frequently 20 tons per day. The Cornish broccoli are followed by extensive supplies from the Midlands; the very best come from the neighbourhood of Northampton.

In March early radishes are received extensively from Worcestershire. One salesman has sold 300 hampers in one day. They leave Evesham and neighbouring stations in the evening and reach Manchester at three o'clock the following morning in excellent condition. As I shall frequently have to mention Evesham as a source of supply, I may here quote what a writer said of it fifty years ago:—

"The vale of Evesham is celebrated for the extreme richness and fertility of its soil, which, by the successful mode of cultivation, produces earlier and more abundant crops than that of any other part of the country. Near the town, on both sides of the river, large portions of ground have been converted into gardens, horticulture constituting the chief occupation of the labouring class: asparagus attains an unequalled perfection in the soil, and is extensively cultivated, and vegetables of every kind are, by means of the River Avon, conveyed hence to the principal towns in the surrounding district."

Since this was written, capital, science, and industry have enabled the gardeners of the productive vale of Evesham to immeasurably increase their out-put, and the railway has come and superseded the River Avon in distributing it.

A great many spring radishes are also grown at Wallasey, on the Cheshire side of the Mersey, and sent to the Manchester, Liverpool, and Yorkshire markets.

Water-cress has become an article of considerable commercial importance; as an early spring salad it is a great favourite throughout these districts, and has a yearly increasing sale. It comes principally from Oxfordshire, where it is highly cultivated and finds employment for a considerable number of peasants. It is cut in the afternoon, put on the train, and reaches the Manchester market at three o'clock the following morning. Many tons are sold here in one day. Thirty-five years ago the only supply of this article to Manchester was brought in a hamper or two by men, who gathered it from the Cheshire ditches.

The first supply of spring cabbages comes from the far-famed

Evesham. They are followed in a few days by those which are grown around London; then come the Lincolnshire and Cheshire cabbages, and those grown in the neighbourhood of Warrington.

Asparagus is now plentifully supplied; the quantity consumed has probably quadrupled in the last eight years. One salesman has sold a hundred hampers here in one morning. Worcestershire (Evesham) and Northamptonshire are the chief sources of supply.

The first green peas which appear in the market come from Algeria, Spain, and France in the order named. The first English from Evesham, the next from Nottinghamshire, and lastly from Yorkshire. From these two latter places the supply is enormous; one salesman has disposed of 1500 sacks in one day; the quantities grown in Cheshire and Lancashire are quite insignificant in comparison, and call for no further notice. The rule is to market peas the next morning after they are gathered. If they stand in bulk more than one night, fermentation sets in, and they are much depreciated. The rates for bringing green peas to Manchester from Nottinghamshire are—for two tons and upwards, 13*s.* 4*d.* per ton; one ton and less than two, 20*s.* They are put on the railway at Newark, Collingham, Swinderby, and Rollston.

From Yorkshire—Burton-Salmon, Selby, and neighbourhood, 11*s.* 8*d.* per ton; York, 12*s.* 4*d.*; Milford Junction, 12*s.*

I should have previously stated that the rate from Evesham is 20*s.* per ton.

In all cases the minimum weight for these rates is two tons, and lesser consignments are charged higher rates.

Six thousand five hundred sacks of peas have been pitched in the Manchester market in one day.

The first new potatoes seen in the market come from France, in small quantities, and are always dear. In May they come from Cornwall and the Scilly Isles, and are followed by large quantities from Jersey. The Jersey potatoes have very greatly improved in quality in the last few years, and the sale of them has consequently much increased. From the small beginning of a few baskets twice a week, the trade has grown to many tons daily. One salesman has sold 40 tons of them in one day. The Jersey are closely followed by the "Ormskirk Pink-eyes;" of all early potatoes these are probably the very finest flavoured. For many years their production was exclusively in the hands of small farmers and cottagers occupying the district lying between Southport and Liverpool; but of late years their cultivation has extended through South Cheshire, from the neighbourhood of Warrington away to Dunham-o'-th'-Hill. Much care is required and bestowed upon their production; they are kept indoors till they have sprouted, and then are carefully planted in "butts," over which straw-mats are laid during the night and on cold days, to shield them from the frost. These supplies are followed by those grown on both banks of the River Mersey, chiefly between Warrington and Barton. Vast quantities of excellent late potatoes are also received from North-west Lancashire; indeed, it may be said that the county in which the tuber was first grown, after its introduction into England, has never since shown it any neglect. The once-popular "Fluke" potato was raised from seed by John Turner, a labourer on the Langley Hall Farm, at Birch, near Middleton: it has now fallen quite out of favour, and is but sparsely grown.

All through the winter large quantities of potatoes are received from Yorkshire, from Lincolnshire, and from Scotland; most of these are those known as the "York Regent," than which no better late potato need be grown. I have no means of ascertaining the quantity of potatoes brought into Manchester in a year; but as all the populous towns by which it is surrounded draw their supplies from it, the total quantity must be immense.

Beside the great Fruit and Vegetable Market at Shude Hill, there is an extensive potato market on the premises of the Lancashire and Yorkshire Railway Company, in Oldham Road; this market is in the hands of the Railway Company, who pay the Corporation 1500*l.* per annum for the privilege of holding it. Under the agreement, potatoes and carrots only are permitted to be sold there, and none but those which arrive by the Company's line.

The largest quantity of new potatoes brought into the market at Shude Hill in one week, from 1870 to 1879, inclusive, has been as follows:—

LOADS OF 18-STONE.

1870.	**1871.**	**1872.**	**1873.**	**1874.**
21,000	29,500	18,200	19,100	18,750
1875.	**1876.**	**1877.**	**1878.**	**1879.**
18,500	19,000	14,300	23,000	22,250

That the home-grower of this popular and useful article of food has not a monopoly of its growth, however, the following figures will testify; they are copied from the Government Return for 1877. I have been unable to procure last ear's Return, but I believe the quantity to have been greatly in excess of that in 1877. I learn from a private source that the quantity shipped from Hamburg alone, last year, was 4,592,270 cwts.:

Year 1877—From

Germany	3,636,600 cwts.	Portugal..	38,019 cwts.
Holland	729,941 „	Channel Islands ..	364,451 „
Belgium	933,021 „	Malta	63,253 „
France	2,079,185 „	Canada	84,756 „

making a total of 7,929,226 cwts.

The following are the rates for carrying potatoes to Manchester from many of the places named:—Belgium, 14*s.* per ton; Hamburg, 22*s.* 6*d.*; France, 35*s.*; Jersey, 50*s.*; St. Malo, 50*s.*; Ayrshire and district, 21*s.* 8*d.* to 23*s.* 4*d.*: Perth and district, 25*s.* to 27*s.* 6*d.*;.Goole, 11*s.* 10*d.*; Hull, 13*s.* 1*d.*; Keadby and Crowle, 12*s.* 2*d.*; and Holbeach, 16*s.* 6*d.*

Cheshire. — Delamere, 8*s.* 8*d.*; Mouldsworth, 5*s.*; Manby, 9*s.*; Helsby, 9*s.*; Tarvin, 9*s.*; Mobberley, 7*s.* 11*d.*; Knutsford, 7*s.* 11*d.*; Plumbley, 8*s.* 4*d.*; Northwich, 8*s.* 9*d.*; Hartford, 8*s.* 6*d.*; Cuddington, 7*s.* 6*d.*; and Wallasey, 8*s.* 4*d.*

Carrots first appear in the market in April: they come from France in bunches. About the first week in June they begin to arrive from Holland, also in bunches. Then come supplies from Bedfordshire. Towards the end of August large supplies come loose in trucks from Lincolnshire and Huntingdonshire, increasing in quantity as the season advances. The rate for bringing them from the last three places mentioned is from 11*s.* 8*d.* to 13*s.* per ton.

The turnips supplied to the market for culinary purposes are grown almost exclusively within a few miles of it; they consist of three sorts. First, a very excellent variety raised by Mr. James Kelsall, late of Stretford, now of Picton Gorse Farm, near Chester, about fifteen years ago. During the winter two yellow kinds are most in favour, the "Orange Jelly," brought out by Messrs. Dickson and Brown, the eminent seedsmen of Chester, and the "Scarisbrick Yellow." The "White Stone," generally seen in the South of England markets, finds no favour here.

Forced rhubarb makes its first appearance in the market in Christmas week; as the spring advances the supply increases, and large quantities are sold. A great deal is grown in this locality; but the largest quantity, and the finest quality that comes from any one place, is grown by Mr. Joseph Whitwell, of Kirkstall, near Leeds; Mr. Whitwell has made its cultivation a speciality. The forced is succeeded by an abundance of the naturally grown, nearly every gardener who comes to the market contributing a portion. Thirty-five years ago the late Mr. Samuel Osbaldiston, of Baguley, was almost the only person who brought rhubarb to the market. He grew the kind known as "Myatt's Victoria;" there was then an intermittent supply of the dwarf red kind, grown upon Preston old racecourse. But

Mr. Osbaldiston was undoubtedly the first who brought rhubarb into the Manchester market, and he also claimed a similar honour for strawberries.

Vast quantities of green vegetables are grown in and about Stretford, where the land is very highly cultivated, for this market; and in Stretford and the adjacent parishes of Ashton-upon-Mersey, Sale, Baguley, and Timperley, many strawberries are grown. Apples, pears, and plums were formerly plentifully grown about Stretford; indeed, forty years ago there were no more fruitful orchards north of the Trent, but the same city which has contributed so much to the wealth of the owners of the soil around it has, with its polluted atmosphere, made sad havoc with their trees, which now "but cumber the ground;" and consequently are fast disappearing under the axe to make way for the growth of things more profitable.

Celery usually makes its first appearance in the market about the second week in July. It is grown extensively upon the moss land in the parish of Ashton-under-Lyne, and is the variety known as "Lady White." This is followed by the "Seymour White," grown principally about Sale, Ashton-upon-Mersey, and Timperley; and next comes a supply from the neighbourhood of Retford in Nottinghamshire, which is called the "Grove-red." A considerable quantity is also sent from Lincolnshire; from the two last-mentioned places the supply lasts into April.

English onions are chiefly supplied from Bedfordshire; from August to May there are frequently from 60 to 80 tons sent to Manchester from that locality in one week; the carriage costs from 18*s.* 4*d.* to 20*s.* per ton. Between July and April large quantities come from Holland; rates for carrying about 23*s.* 4*d.* per ton.

From September to June there are heavy arrivals from Germany; the lowest rate for bringing them is 26*s.* 10*d.* per ton; when brought from the most distant part of that country the rate is as high as 5*l.* per ton. Of course such importations can be made only when the price is very high.

Arrivals of Belgian onions are in their plenitude during August and September; rates about 24*s.* per ton. From October to January, Bordeaux sends us a considerable quantity; they are shipped in cases of about 1 cwt. nett; cost of carriage, 2*s.* 1*d.* per case. During May, June, and July the supplies are from Portugal; and in the same months, on a limited scale, from Malta and the Levant; rates from Liverpool 7*s.* 6*d.* per ton.

Cucumbers here not inappropriately follow onions, and for the additional reason that—like that useful and popular bulb—they are grown chiefly in Bedfordshire. They are planted in fields of large extent, and no artificial heat being used, they are not ready for the market until August, when they soon become very plentiful, and consequently exceedingly cheap. From 100 to 120 tons per week are in good seasons poured into the market, and on such occasions they are sometimes retailed at four a penny.

The English early cucumbers always fetch a good price up to about the end of May, when they have to compete with importations from Holland.

Without separately mentioning every kind of vegetable, suffice it to say that all and every kind of herb, that has come into ordinary use, is plentifully and cheaply supplied to the vast community of these districts, through the great central market at Manchester, and that not only does the supply diligently wait upon the demand, but, by the enterprise of the British growers and the importers, the supply occasionally creates the demand!

I am bound to say, however, that in speaking of "the enterprise of the British growers," I refer more particularly to those at a distance. And I trust my rural friends—the market-gardeners and farmers of this locality—will not think me presumptuous, and that I am travelling out of my province, if I express the opinion that they are somewhat slow in discovering and supplying many of those things which are most remunerative to the grower. For many years they permitted the more heavily rented growers in the vicinity of London, who were handicapped with the cost of bringing it 200 miles to market, to supply us with rhubarb. It is within my own recollection that not a single cos-lettuce—the only sort fit to be eaten—could be obtained in Lancashire but what came from beyond London, and for many years no one here attempted to grow these things; now everybody grows both. Probably nothing is more easy to grow than scarlet-runners, and nothing finds a readier sale in the Lancashire markets. I have seen them sold this year at 8*s.* a bushel, but they came from a distant part of the country, the local gardener or farmer at the same time bringing a cartload of cabbage which sold for very little more. Brussels sprouts are also eagerly sought for here, and bring 2*s.* or 3*s.* a peck; but the local grower of vegetables says, as he once said of rhubarb and cos-lettuce, "I cannot grow them," notwithstanding that few things are as hardy. A Stretford gardener's excuse for not growing Brussels sprouts, as given to me, was "the land about my neighbourhood is too rich." Well, when we see so many fields in Cheshire, whose principal crop is rushes, we certainly cannot allow the farmer or gardener who occupies them to plead the same excuse. The cost of bringing these heavy commodities from a long distance is great, and should be, if not a "prohibitive duty," at least a "protection" to the local grower, to say nothing of him being enabled to bring his goods to market in a fresher condition. Besides, the words, "My own growing," have a magical effect, and seldom fail to secure the preference of the purchaser; indeed, so much are these words valued by the seller—and abused—that I once heard them used by a fellow selling *cocoa-nuts!*

There are yet growers bringing their goods to the Manchester market who can remember the time when they had no foreign fruit to compete with. Oranges, lemons, and the dried fruits of the "Sunny South" were merchandize that never excited their jealousy: but it would be difficult to say in these days what kind of fruit is not imported and pitched in our markets alongside, and in competition with, the home-grown. If we had to depend solely upon the British grower now, however, I fear fruit would be a luxury out of the reach of the working-class of the community. Up to the 16th of August, 1838, the duty on imported apples was 4*s.* per bushel, and in that year but 20,502 bushels were imported. The duty was then reduced to 5*l.* per cent. *ad valorem*, and the very next year 120,000 bushels were imported into the port of London alone, and the average price they were sold at was 4*s.* 9*d.* per bushel. The importation of apples went on steadily increasing up to the year 1846, when it received a great impetus by the total abolition of the duty. Yet the price of good apples is higher now than when the maximum duty was exacted. I learn from the evidence given before a Select Committee of the House of Commons which sat in 1839, "to inquire into the Fresh Fruit Trade," that the reduction of the duty had driven the Kentish growers to despair, and that they talked of grubbing up their orchards. That did not take place, however, to any great extent; but where apple-trees were removed, cobnut-trees and raspberry canes were put in their place, and both these pay much better than common apples. Home-grown fruit has, and must always have, a great advantage over the imported by being delivered in our markets fresher and in a generally better condition. It is the better sorts of apples that are imported, such as the French "Royal Russet," and the incomparable "Newtown Pippin" from America, that the English grower has most to fear from. Five other sorts of apples, beside the "Newtown Pippin" and "Ribstone Pippin," are now sent from America, some only fit for culinary purposes, and all far inferior to the pippins named. The cost of bringing them from New York to Liverpool, last season, was 2*s.* 3*d.* per barrel, weighing upon the average 1 cwt. 1 qr. nett, and 10*d.* from Liverpool to the Manchester market. In 1877, there was shipped from the United States to this country, 336,565 bushels of apples, and from Canada 44,295 bushels. I cannot give last year's importation, but I know it was much in excess of 1877.

This market also receives large quantities of apples from Belgium, in casks which contain about 4 cwt., and last year they were brought from Antwerp to Goole for *ninepence per cask;* conveying them from Goole to Manchester cost 15*s.* 10*d.* per ton. Probably the growers of the common sorts of culinary apples in Lancashire and Cheshire would find their account in superseding them with raspberries, which always command a good price, and which will never be subject to the competition of foreigners, owing, from their soft nature, to the difficulty of transit.

Excellent pears are imported from France and Jersey.

French-grown strawberries now reach our markets before the English are ready; they are shipped from Brest in small boxes. About 7000 per week came to Manchester for three weeks this year. They are followed by large supplies from Cornwall, Worcestershire, Kent, and Cheshire, in the order named, and lastly from Scotland. Upwards of 3000 packages of this fruit were disposed of by one salesman one day this year, the cost of carriage by railway for which was between 60*l.* and 70*l.*

The first cherries also come from France. It takes three days from their starting to their delivery here, consequently considerable loss is occasionally experienced from their changed condition. Ripe fruit put on the railway at mid-day in Cornwall is delivered here early next morning. Put upon the railway in Kent or Worcestershire at five o'clock in the evening, it reaches Manchester by three on the following morning. This is a splendid service, and leaves nothing to be desired. When we consider that these fruits are gathered one day and sold over the retail counter to consumers before the ordinary dinner-time on the next, 250 miles away, it must be allowed that the acme of accommodation has been reached. It takes a longer time for carts to reach the market from the distant parts of the adjoining county of Chester.

Vast quantities of currants are sent here from Kent; 20 tons have been sold in one hand in one day. Gooseberries are received from Worcestershire, Cambridgeshire, Cheshire, and the north-west of Lancashire. From the first and last-named places they are not marketed until ripe: from the other two they are stript from the trees in a green and hard state, and come to market in sacks like grain. The neighbourhood of Preston, in this county, is celebrated for the excellence of its gooseberries.

The trade in German bilberries is an important one, about

10,000 baskets of 12 lbs. each per week are received here during the season; they are sold at from 1*s*. to 3*s*. per basket, and cost 10*d*. each carriage. Many are sent also in small kegs from the banks of the Rhine, and the cost of conveyance is 4*d*. each. The very best bilberries, however, are gathered on the Welsh hills: they are much superior in flavour, and reach the market fresh and in blooming condition. From Germany come large importations of plums also, "Violets" and "Winesours," the latter in great abundance; they are a well-flavoured plum, and their German name is "Zwetchen;" rate of carriage, 4*l*. per ton. From the north of France come "Violets," "Black Orleans," and "Greengages;" rate, 6*l*. per ton.

The greatest number of baskets of fruit pitched in the Manchester market in one week, from 1870 to 1879 inclusive, has been as follows:—

1870.	**1871.**	**1872.**	**1873.**	**1874.**
68,000	72,000	51,100	82,700	73,500
1875.	**1876.**	**1877.**	**1878.**	**1879.**
86,250	81,450	77,200	102,250	90,000

To enter into further details, and refer separately to all the other kinds of fruit which are covered by these figures, would require more space and time than it would be desirable to occupy, and as I have mentioned all the principal sorts, there seems to be no necessity for doing so.

Whether the promoters of this inquiry will consider that the writer has sufficiently obeyed their instructions in other respects, he can only conjecture. "The Sources of Supply" are pretty fully indicated; it is absolutely impossible to obtain with any degree of accuracy "the average quantities that arrive by road and railway;" and as for "the advantages and disadvantages of the local grower from climate and seasons," I feel that it is too obvious that the former are far outweighed by the latter. That the local grower has some advantage over the distant as regards transit it cannot be denied, but even this is somewhat modified by the low rates charged for carrying foreign produce by the railway. I think that an examination of the figures I have quoted upon that subject will show that there was some ground for its being recently stated in both Houses of Parliament that the importer was more favoured in this respect than the home-producer. As regards the market tolls, they apparently are on an equality; but, in fact, inasmuch as all foreign produce is packed in much smaller parcels than the home-grown, the toll on the foreign is more than double that on the home-grown. A hamper of fruit as packed by the home-grower, and for which a toll of one penny is charged, will contain six times the quantity as packed in small baskets by the foreigner, which are charged one halfpenny each.

It will be seen that I have spoken of but one Manchester Fruit and Vegetable Market, and for the simple reason that it has but one that need be referred to for the objects of this paper.

There is still a market upon the ancient site opposite the Exchange, which gave the name to "Market Stead Lane," now Market Street. In the spring, and through the summer, the old "Stead" is full of flowers, plants, shrubs, and trees; it is very picturesque, and strikes the eye like an oasis in the brick-and-mortar and sooty desert. There were formerly several retail markets scattered over the town; but their usefulness having departed, they themselves no longer exist.

The time is not far distant when *retail* markets will everywhere become things of the past—and why should it not be so? The system so long in vogue in London of the housekeeper being supplied by the "coster" is rapidly spreading in the provincial towns, and shops are now opened in almost every street for the sale of fruit and vegetables. That this must be far more economical than the retail-market system can be easily shown. The market, for the sake of convenience, must occupy a central situation, and in such situations land in large towns has become valuable, and necessitates the payment of a heavy rent from the stall-keeper, and this, of course, falls upon the customer. And it does not require a large amount of perspicacity to see that it must be infinitely less costly for one dealer to convey goods to a hundred consumers than for a hundred consumers to resort to a distant market for the supply of their daily wants. But these arguments tell in the opposite direction as regards a wholesale market. There must be a great central depot to which the retailers of the surrounding districts can repair in full confidence of procuring all they may require to satisfy the demands of their customers, and such a place is that which I have herein attempted to describe: "*The Fruit and Vegetable Market at Manchester.*"

XXVII.—*The Cumberland and Westmoreland Farm-Prize Competition*, 1880. By HERBERT J. LITTLE, of Coldham Hall, Wisbech.

IT would be difficult to find a more interesting district than that assigned to the Farm Prize Competition in connection with the Carlisle Show. Besides the entire counties of Cumberland and Westmoreland, the hundred of Haltwhistle, in the western part of the county of Northumberland, was included in the plan, its natural features apparently qualifying it for competition with the rugged districts of the two counties associated with it. However, no entry was made from this quarter, and it may be dismissed with this brief notice. But one need not go beyond the borders of the "Lake Counties" to find a country of surpassing interest. Their natural charms have long been recognised as superlative even in a country which boasts so much beauty as England. In no part can the hills which diversify the landscape with such justice be called mountains; nowhere can such lovely lakes be seen; and over no district has such a spirit of poetry been shed. But without these attractions, he would be a careless traveller who forgot its connection with some of the most striking pages of English history; who did not call to mind the ancient deeds of daring which along all this border-land were reflected in the minstrelsy of the times, or carried down by tradition from generation to generation. The graphic pictures given us in the pages of Macaulay and other historians enable us to recall to some slight extent the warlike scenes or tragedies to which for many a century these counties were subject, by reason of their neighbourhood to a bitter and relentless enemy; and one at least of the farms visited bears tokens of the days when in very truth it was necessary that every man's house should be his castle. Another is close to the spot where Charles Edward's army, after his unsuccessful invasion of England, having to beat a hasty retreat, forded the Esk where it was breast-deep, towards the end of November. "There were at one time 2000 men in the water, with only their heads and shoulders visible.* On reaching the opposite side the pipes struck up and the men danced reels until they were dry." Though in these peaceful times it may be difficult to realise the days when the sound of the horn across the vale, or the beacon-fire on the hill-top, again and again called every man to another turn at his traditional foes; when bloodhounds were kept to track the marauder to his lair; and when the knowledge of the mountain-paths, now trod only by shepherds or casual tourists, was guarded as a family secret by the dalesmen;—he would not be a very intelligent wayfarer who did not associate the scenery of the country with some of these reminiscences: and I trust I may be pardoned this brief allusion to a period whose annals are written in many a song and legend, and whose history is enshrined in many a hoary castle and ruined tower, now devoted to the peaceful pursuits of husbandry.

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* Murray, p. 100.

Again, the prosaic reporter of the commonplaces of agricultural progress or routine may be going beyond his province should he venture an allusion to that poetic halo which has been especially shed in modern times upon the Lake and Mountain districts of these counties. And yet it is difficult to move in a region, every part of which is associated with the genius of Wordsworth, or of some other of that famous group of men who made it their school as well as their home, and forget the part they have had in increasing its attractions. The names of the Coleridges and Southey, of Christopher North and De Quincey, crowd to one's memory in connection with that of the great man already mentioned; and in our own day the great prose-poet, art-critic, and, perhaps I might add, moral philosopher of the century, has also made it his home. If Rydal Mount will ever be associated with the genius of Wordsworth, so in future times should Brantwood be with that of John Ruskin.

But to proceed to more relevant topics. It is not only its history, or its natural beauty, or the *genius loci* which still lingers in the land, which makes these counties so interesting. There is also in them much to engage the attention of the agriculturist. It is a land where small proprietors—"statesmen," as they are locally called—have until lately always been the backbone of the country, and therefore where some politicians of the day who are anxious to test the experiment of peasant proprietorship in other quarters might perhaps learn some useful lessons. Turn then to any reliable account of these counties, and we shall find that these small proprietors are gradually, but surely, diminishing in number, and that the extinction of this class of men is probably not very far distant. Mr. Webster's 'Report on Westmoreland' (Vol. IV., New Series, p. 8) is very emphatic on this point. Unfortunately our own observations did not extend to the remnants of this once important class of owners. The competition for the Farm Prizes was by desire of the Local Committee limited to farmers paying a *bonâ fide* rent for all land in their occupation, and we were therefore precluded from making what might have been an interesting comparison.

Before I say a few words about the geology of the district under consideration, let me dispel a fallacy which I know is pretty common among untravelled "Southrons," and even among those who have perhaps made a hurried tour of "the Lakes;" and that is, the non-importance of Cumberland and Westmoreland in an agricultural point of view. That a good proportion of these counties is the "land of the mountain and the flood," and more legitimately the "playground of England" than the scene of agricultural activity, cannot be denied; but a not inconsiderable portion of Cumberland is of no greater elevation than many of the midland counties of England, and is of that gently undulating character which presents few difficulties to the cultivator of the soil. The Physical Map of the county attached to Mr. Dickinson's Report will give a good general idea of the very considerable area of this section, though Mr. Dickinson's description given on the map * of "Lands where Wheat is usually grown" requires considerable modification in the present day, when that cereal scarcely pays for cultivation even in districts of more favourable soil and climate. The consideration of the latter factor, viz. the climate, is all important to the farmers of this northern district, where harvest is necessarily a late and often a tedious operation; and in many parts the cultivation of all cereals, except oats, has been abandoned.

In the Table which occupies pages 489, 490, I have given some agricultural statistics which cannot fail, I think, to be interesting to the reader. From this Table it will be seen that the proportion of cultivated land to the total area in the county of Cumberland is by no means despicable, approaching nearly to 60 per cent. of the whole surface; and that even in Westmoreland, with its rugged hill-ranges, no less than 49½ per cent. is more or less cultivated.

An analysis of the figures there given will, however, show how strikingly in some particulars the cultivation of the soil differs from that pursued in the more southern regions of England. It will be noted that Westmoreland in 1878 and 1879 grew little more than 1000 acres of wheat, and that Cumberland last year produced only 16,000 acres of the same cereal. The area of barley, it will be observed, is extremely limited, but the acreage of oats in each county is considerable, amounting in Cumberland to about one-eighth of the whole cultivated surface, and in Westmoreland to about a fifteenth.

The columns on p. 490 are, however, those to which I desire particularly to call attention, viz. that section in which I have tabulated in succession the corn-crops, the green crops, the rotation-grasses, and the permanent pasture for the ten years

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* 'Journal of the Royal Agricultural Society,' vol. xiii. (old series) p. 207. 1852.

STATISTICS ABSTRACTED FROM AGRICULTURAL RETURNS (1879).

CUMBERLAND contains .. 970,161 acres total area.
WESTMORELAND .. .. 500,906 ,,

TOTAL ACREAGE OF CROPS.

	1878.	1879.
Cumberland	563,470 = 58·1 of total area	571,639 = 58·9 of area.
Westmoreland ..	242,651 = 48·4 ,,	245,247 = 49·0 ,,

ACREAGE OF PRINCIPAL CORN CROPS.

		1878.	1879.			1878.	1879.
Cumberland	Wheat ..	15,214	16,264	Westmoreland	Wheat ..	1,088	1,134
,,	Oats ..	70,463	69,182	,,	Oats ..	16,043	15,600
,,	Barley ..	7,781	7,899	,,	Barley ..	2,370	2,539

ACREAGE OF PRINCIPAL ROOT CROPS.

Cumberland	Potatoes ..	10,881	11,928	Westmoreland	Potatoes ..	1,779	1,841
,,	Turnips, &c.	31,568	31,776	,,	Turnips, &c.	7,861	7,744

ACREAGE OF GRASSES IN ROTATION.

Cumberland	93,017	104,649	Westmoreland	15,892	15,743

ACREAGE OF PERMANENT PASTURE.

Cumberland	325,468	321,119	Westmoreland	196,185	199,355

NO. OF HORSES.

	1878.	1879.		1878.	1879.
Cumberland	20,438	20,854	Westmoreland	8,158	8,539

NO. OF CATTLE.

Cumberland	129,386	126,494	Westmoreland	61,586	61,658

NO. OF SHEEP.

Cumberland	515,931	514,727	Westmoreland	348,174	356,220

STATISTICS ABSTRACTED FROM AGRICULTURAL RETURNS (1879)—*continued.*

	1870.	1871.	1872.	1873.	1874.	1875.	1876.	1877.	1878.	1879.
ACREAGE UNDER GREEN CROPS, 1870 TO 1879.										
Cumberland	51,398	50,764	48,635	50,676	44,668	46,695	48,207	47,084	45,303	47,158
Westmoreland	11,729	11,431	11,345	10,716	10,053	10,518	10,792	10,409	10,317	10,335
ACREAGE UNDER CORN-CROPS IN SAME YEARS.										
Cumberland	115,337	109,965	105,423	100,704	98,543	96,668	94,799	96,047	94,420	94,275
Westmoreland	23,298	22,834	22,162	20,663	20,532	20,590	20,277	20,471	19,688	19,429
ACREAGE UNDER ROTATION-GRASSES IN SAME YEARS.										
Cumberland	121,823	108,730	107,189	99,958	97,357	99,703	96,317	93,736	93,017	104,649
Westmoreland	22,336	23,583	19,750	19,792	18,650	17,626	15,964	15,380	15,892	15,743
ACREAGE IN PERMANENT PASTURE IN SAME YEARS.										
Cumberland	229,543	261,979	266,468	283,803	300,688	298,026	305,677	314,881	325,468	321,119
Westmoreland	168,229	170,159	177,923	186,745	188,870	189,596	191,499	192,077	196,185	199,355

ending 1879. A glance at this Table will, I think, reveal some useful information. It will be noticed in the column of corn-crops that their cultivation has seriously declined, and that this decline has been steadily progressing through the whole period; so that in 1879, 25,000 acres less of cereals were grown in the two counties than in 1870. During the same period the acreage of green crops appears to have remained pretty nearly stationary, but the acreage of rotation-grasses shows an equal decrease to that of corn.

In 1870, the percentage of land under rotation-grasses was higher in Cumberland than in any county in England with the exception of Cornwall, viz. 12·06 per cent. These rotation-grasses have, however, now given way to permanent pasture to a considerable extent, as is evidenced by the increased area of the latter, which had risen from 23·07 per cent. in 1870 to 33·1 in 1879; an increase not equalled by any county but Monmouth.

Indeed, a glance at the line devoted to permanent pasture shows how much the tendency must recently have grown to throw aside the plough. When it is observed that these two counties in the ten years ending 1879 had thrown about 123,000 acres into permanent pasture (presumably land which had previously been cropped), we have an evidence of the silent working of economical laws and forces, and of their influence on the agriculture of our land.

But such changes as those indicated could scarcely have taken place in regions less adapted by Nature for pastoral husbandry, and this leads me to devote a few words to the climate of the district.

It is well known that a portion of the Lake district has the perhaps unenviable notoriety of receiving a larger amount of rainfall than any other part of Great Britain, or even of Europe; but the prodigious torrents which are precipitated over some of the central masses of these mountains seldom extend beyond their flanks, and as far as the rainfall of the whole district is concerned, it will be seen from the Table which I have drawn up on page 492, that in the larger part of it it is by no means excessive. It will be noticed, however, that it has this characteristic—even at Carlisle, which gives a smaller average than any of the places tabulated—that the rainfall never drops to the level of the droughts which occasionally afflict the midland and eastern counties, whilst its maximum limit (at least in the 20 years named) has not equalled the fall in many less purely pastoral districts in England.

The seven rainfall stations given in the upper part of the Table, viz. Carlisle, Silloth, Cockermouth, Braystones, Penrith, RAINFALL in CUMBERLAND and WESTMORELAND, from 1860 to 1879.*

	1860.	1861.	1862.	1863.	1864.	1865.	1866.	1867.	1868.	1869.	1870.	1871.	1872.	1873.	1874.	1875.	1876.	1877.	1878.	1879.
Carlisle	..	..	..	30·01	24·29	24·72	27·50	22·20	28·93	27·66	23·28	28·12	37·63	30·37	35·75	28·03	31·70	44·63	29·68	26·19
Silloth	37·81	42·47	44·19	43·85	33·57	28·74	36·76	26·48	37·68	..	27·18	30·64	45·91	33·71	36·01	28·82	34·96	47·61	29·26	35·53
Cockermouth ..	..	..	50·19	51·63	41·33	37·79	50·77	38·35	50·12	46·31	41·72	36·89	55·83	40·84	46·31	37·09	38·96	59·28	36·05	36·80
Braystones Whitehaven ..	..	..	..	50·55	35·02	33·20	40·80	33·24	35·65	40·77	31·17	32·92	51·91	36·62	37·84	31·61	37·81	58·82	30·89	31·58
Penrith	37·80	37·44	33·79	36·55	35·08	24·88	41·71	28·25	38·55	39·21	23·17	30·83	49·63	27·86	36·15	28·66	31·53	..	31·80	26·55
Appleby	38·23	41·96	31·89	35·31	28·85	30·26	39·36	34·55	39·01	37·49	27·31	31·80	45·92	29·03	39·02	32·41	31·85	45·66	29·89	
Kendal	57·00	60·70	54·11	54·92	47·17	42·67	60·39	47·31	52·75	55·50	43·09	50·25	69·18	49·37	55·11	46·22	51·86	65·78	43·76	43·14
Keswick	51·17	74·12	61·63	71·54	52·64	49·18	70·81	52·11	65·72	72·00	55·27	46·18	83·15	51·99	67·03	50·92	51·51	79·12	52·25	48·02
Seathwaite Borrowdale ..	112·20	182·58	170·03	173·84	131·67	117·49	179·72	133·31	157·11	159·11	119·60	115·15	182·05	146·53	148·79	118·80	111·03	180·40	111·88	112·26
The Stye .. Ditto ..	..	..	..	..	..	119·07	221·66	181·71	207·19	198·19	..	..	243·98	..	..	..	..	..	149·04	118·65

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* From G. J. Symons' Tables, published yearly in 'British Rainfall.' E. Stanford, London.

Appleby, and Kendal, sufficiently represent the agricultural part of the district; and of these, Carlisle, Silloth, Penrith, and Appleby, being farthest removed from the mountain masses, most accurately show the pluvio-metrical conditions of the cultivated parts. I have added the Keswick, Seathwaite, and Styehead stations at the bottom of the Table, that my readers may see the vast difference between the rainfall of the Lake country and a good deal of the rest of the two counties.

It is many years since Keswick lost the pre-eminence which it once enjoyed of being the wettest place in Great Britain; and, in fact, this reputation was gained for it by the absence of scientific observation in most other parts of the kingdom at a time when accurate records had long been established at this station. But it is not very long since Seathwaite was deposed, and the "Stye" (well known to travellers crossing from Borrowdale to Wastdale) was promoted to the apex of rainfall renown.

But over the agricultural districts the climate is perhaps more humid than positively wet, as shown by the Tables, and moreover is of that moderate and equable temperature which seems naturally associated, to an agriculturist, with oats among cereals, turnips among roots, and abundance of grass. The Gulf Stream, which sweeps the shores of Cumberland, no doubt lends this equability to its climate; and in summer its vapours are precipitated immediately they touch the cold mountain-tops, whilst in winter they penetrate inwards and mitigate the natural asperity of the season. It is said (I know not with what foundation of authority) that Silloth can boast a mean annual temperature exceeding Hastings by 1°, and that the mean daily range of temperature of that place is only 13·2°; but that the whole of this coast and the opposite Scotch shores of the Solway enjoy a remarkable immunity from extremes of heat or cold there can be no doubt to any one who will watch from day to day the maps of the Meteorological Department of the Board of Trade, which afford such valuable information on these subjects.

The geology of the district is complicated, but is of an exceedingly interesting character. The Maps appended to the Reports of Mr. Dickinson on Cumberland (p. 207, vol. xiii., old series), and Mr. Crayston Webster on Westmoreland (vol. iv., new series, p. 1), will give a general idea of both the physical and geological features of the two counties, and I shall only say a few words upon this subject, fascinating though it be, by reason of the researches of Sedgwick and others.

Almost the whole of the great mountain masses are of slate, entirely of the upper Silurian formation, and next in order comes the Old Red Sandstone, with its conglomerates, which covers a very small area of these counties. Then came the various calcareous rocks; the Mountain Limestone and the Carboniferous Series, and after another volcanic period, the tranquil deposition of the New Red Sandstone began. This latter formation is perhaps the most important, agriculturally, in the two counties. In Cumberland it extends over almost all the country north of the mountains; it fills the vale of the Eden in both counties, and there is moreover an important tract in the neighbourhood of the west coast, extending from Whitehaven southwards to the borders of Lancashire. The valuable deposits of hæmatite are found in connection with the Carboniferous Limestone, and the Whitehaven Coalfield, which is worked beneath the sandstones and limestone, is an important feature in the industrial view of the district.

The superficial geology of this part of the country has lately received the attention of the Geological Survey, and a good part of the district has now been mapped with this object. If any readers are curious on this point they can therefore now gain most valuable information from the courteous authorities in Jermyn Street, and I regret that I am precluded by the question of expense from adding to this Report a map of the country showing some of the principal features of these deposits. But, though the geological characteristics no doubt form some indication of the nature of the county, what Mr. Dickinson stated in his able report on the farming of Cumberland (before alluded to) is perfectly correct: "Notwithstanding all that has been written by scientific men on the geology of these counties, none have satisfactorily shown that the soils, generally speaking, convey anything like a correct indication of the underlying rocks. Where the rocks are near the surface, of course the connection is more intimate; but so much of the low-lying parts, and some at a considerable elevation, are so deeply covered with the diluvium conveyed from distant parts that, in very many places, the surface conveys no adequate idea of what rocks may be expected beneath. Where this diluvium prevails, it covers all rocks alike from a depth of a few inches to some hundreds of feet. Nearly the whole of the New Red Sandstone, the coal-fields, the Carboniferous Limestone of the lower county, and the skirts of the older rocks, are covered with it. In most parts of the county [Cumberland], and especially in the west, it is largely intermixed or overlaid with a compact clay which is very retentive of water. Over a great extent this clay (in which more or less of the rounded drift-gravel is imbedded) forms the subsoil and the intermediate and sometimes alternating strata, from the soil to the rock. As the clay or the sand predominates, it forms the wheat or the barley-soils, if the elevation suit those crops; but at the higher levels, where the cultivation of wheat ceases or is precarious, these variations of subsoil, in connection with the depth and kind of soil, form the gradations of the different qualities of the upper and inferior grass-lands."*

But there are other points in connection with the farming of these counties which at the present time should engage the attention of the agricultural world. I do not believe a district in England could be selected where farmers and landlords have been so little "hit" by the prevailing "agricultural depression" of the last few years as the counties of Cumberland and Westmoreland. And this leads me to notice a few of the peculiarities of farm management and country life.

Nothing perhaps strikes a traveller from the southern counties more, when visiting the farms of the north, than the contrast which the homesteads of the one offer to those of the other. That snugness and air of comfort which he has been wont to associate with the very name of "farm" in the south is rarely found in Cumberland or Westmoreland. The neat trim garden, the sheltering trees, the cosy buildings which often lend themselves to picturesque treatment, the comfortable yards with cattle ruminating in the clean straw; these are objects which the eye in vain seeks in these counties. Instead of these delightful pictures, which have reconciled many a man to an unprofitable pursuit, an aspect at once gaunt and dreary is imparted to many of the houses by the absence of all attempt to render them attractive in appearance. A stone-built dwelling, covered with whitewash and roofed with the grey slate of the district, with scarcely a patch of garden, and that neglected and desolate, with the midden-stead or "dung-heap" crowding itself almost upon the very door-step, and with the cattle all kept in close byres and stables; these are some of the features of most Cumberland and Westmoreland farms; and they offer a contrast to the southern districts which does not, it must be admitted, give them any advantage over those parts.

Moreover, the byres, when visited, intensify the comparison. In many of these the scarcity of straw does not permit its use for anything but feeding purposes, and the poor animals stand on bare boards, or a stone floor, with a gutter behind their heels, from which their excrements are cleared night and morning in a perfectly unadulterated state. Much praise cannot generally be bestowed upon these buildings. The sheds are in the majority of cases very low, singularly ill-ventilated, and withal badly drained.

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* I am sure I shall be doing good service to the readers of this report by referring them back to the admirable paper alluded to for an immense amount of useful information, on which it is my province only to touch occasionally in my descriptions of the competing farms.

But these drawbacks to the picturesque aspect of life do not alter the fact that, by some means or other, the agriculturist of the north has managed to escape, to a great extent, the ruin which has fallen upon his brother farmers in the south. And perhaps another point of contrast which I am about to mention may have something to do with this immunity, though I do not lay much stress upon it. The custom I allude to is that which prevails in the greater part of Cumberland and Westmoreland, of boarding all the labourers regularly employed upon the farm in the house. This creates a degree of familiarity and equality (so to speak) which is entirely wanting in the relations of masters and men in the south; and I believe the more intimate relationship into which the two parties are brought by this custom has had something to do with the success which has attended northern agriculture. At the same time it is like stepping back seventy or eighty years to witness this arrangement; and it may be doubted whether the farmers of Cumberland, if they once broke free from this custom, would consent to its re-adoption.

But, far more than any usage of this kind, it is probably the intensity of industry pervading all these farms which has recently saved their occupants from collapse. This industry is a thing to be witnessed with admiration, and even sometimes with astonishment. In fact it is almost impossible to exaggerate the laborious activity of each member of a Cumberland or Westmoreland farmer's household. The satirists who attribute the non-success of the modern farmer to the more expensive tastes in which he indulges, compared with the simplicity of his forefathers; the noble lord who has discovered in pianos and lawn tennis the causes of the retrogression of British agriculture; would here find no scope for their wit or their strictures. Work, and that of a hard and unceasing kind, is the daily occupation of each member of the farmer's family; though I am far from saying that the mind is not also considered by these most intelligent people. On the contrary, as far as it was possible to judge, I should say that in intellectual culture they excel the generality of their fellows in the south, whose reading is not usually of a very extensive or liberal character. I cast no slur on the industrious habits of many a household in the south. All I wish to intimate is that they are not generally of the double-tide character of the north. It is common enough to see young farmers taking their share of the regular labour of the farm in any part of Great Britain, but it is not so customary to find, as one does here, the daughters of well-to-do, nay, of affluent parents, milking cows, and feeding calves, besides undertaking the full course of household labour, which, under the circumstances I have detailed, is by no means light nor easy. If, then, the aspiring young farmer of more southern climes, doubtful if in Great Britain any reward can be found for his labours, chooses to turn his steps to Cumberland, and is willing to follow and emulate the indefatigable diligence which he will here find practised, perhaps he may discover in these qualities, even in the present times, the highway to success.

A question arose in the minds of the Judges in considering these prodigious and sustained exertions, as to the classes most benefited by such self-denying toil. It would be unnatural that the farmer himself should not be the chief gainer by self-imposed labours which would not willingly be borne by any hired man; and we saw enough to satisfy ourselves that, as far as the occupier was concerned, scarcely a shadow of the cloud which has fallen on Central and on Southern England had been experienced; but we could not avoid the conclusion that, to say the least, the cultivator did not absorb more than his fair share of the profits created, so to speak, by his own industry.

On the one hand, the rents paid for most of these farms seemed to uphold the conclusion that the landlord got his fair share of this increment; and, on the other, the labourer, with his 10*s.*, 12*s.*, or even 15*s.* a week, besides board at his master's table, did not present himself to our eyes as the pitiable serf which modern writers have loved to depict him.

An enviable state of things may therefore be said to exist: the landlord, the farmer, and the labourer are tiding over the misfortunes of the times (which perhaps might be more serious if they were met with less courage and resolution), with no very great calls one upon the other, though perhaps the middle man of the three is squeezed a little harder than he likes; but still no greater strain has yet been put upon him even, than he is willing to bear by increased toil and more unwearied diligence.

Of course the principal reason of the comparative immunity from severe loss in these counties is to be found in the pastoral character of the agriculture; but even with this feature very prominently developed in some other parts of Great Britain the suffering has been severe. I cannot, therefore, forbear quoting a conversation I had with a farmer who shall be nameless, and which may exemplify the financial condition of a northern farm. After going round the whole farm the following dialogue ensued:—

"I think you told me last time I was here that you never sold corn, or hay, or straw?"—"Yes. Sell corn, indeed! Nay, nay; I buy a bit, but all my corn walks to market."

"Was 1879 the worst year you ever experienced on this farm."—"Yes, by odds; the very worst I ever experienced in my life."

"Well, one more question—Did you lose any money in that year?"—"Nay, nay; I addled a bit; I addled a bit."

Perhaps in this introduction a word ought to be said for the greatest boast of Cumberland and Westmoreland agriculture, viz., the Shorthorn cattle, with which every homestead is crowded. They will, of course, be more particularly alluded to in the description of the several farms, but testimony must here be borne to their superlative character. The breed appears to have made its way till all others are in danger of vanishing before it. Even on the smaller farms, the blood has generally been kept pure, and though no pedigree be recorded, the use of certified bulls has so long been adhered to, that a breeder need be in no uncertainty about their unstained character. The result is probably the grandest race of cattle which, apart from Show and fancy herds, can be found in any quarter of the kingdom.

It must not be supposed that with these admirable cattle the milking properties of the herd are neglected or despised, as is too frequently the case with amateur breeders. On the contrary, great attention is everywhere paid to this important point of farm economy; and in many cases we found a combination of flesh and quality with good milking properties which was as pleasing as it is unusual.

Sheep.—The sheep, as might be expected in a county which varies from sea-level to 3000 feet in altitude, and from warm sandstone to a bare rock, were of all breeds and kinds. Pure Leicesters are kept on some of the lower or very moderately elevated farms. In the vale of Eden we found a very nice flock of Lincolns, for which there is a demand for crossing purposes. In the Lake district, Herdwicks, crossed with Leicester or Shropshire, seem the favourite grazing sheep for the lower lands; near Carlisle Scotch sheep, or Cheviots crossed with border Leicester, were fashionable; in the mountains, the hardy Herdwick is of course the favourite; and on one farm in Westmoreland we unearthed the now almost extinct "Limestone" breed.

All these will find mention in their proper places; but this seems the spot to make some special note of the sheep *par excellence* of the Lake country—the Herdwicks.

Herdwicks.—These hardy mountaineers are said originally to have been introduced into the country by the wreck of a Spanish vessel on the coast, but it is more probable that they were, at some time or other, imported. That they met a want of this mountain district cannot be denied, for they hold their own against all comers, and indeed they seem the only sheep which can really brave the fury of the storm on these wild fells.

The characteristics of the breed may have become familiar to some of my readers at Kilburn last year, where there was a special class for them, and where I am told they excited the facetious remarks of more than one stock reporter, as presenting most of the points in a sheep which should be carefully avoided![*] Not so, however, think their admirers in the north.

They are certainly very odd in appearance, being diminutive in size, their faces and legs grey or mottled, their wool of a hairy texture and a peculiar smutty appearance behind the neck, and sometimes in other parts, giving them a weird aspect.

It is worth notice that the Herdwick tups are sometimes horned and sometimes polled, but generally the former. Castration almost invariably prevents the growth of horns, and the females are never cornute. They are not great breeders. "Twins are putten in at t' mooth," is, in the Cumberland vernacular, the mode of expressing the well-known increase of fecundity in sheep by the consumption of stimulating food, and herbage of this sort few of the lake-fells afford.

Although Mr. Dickinson, in the article which I have before quoted (p. 264, vol. xiii., Old Series) places them as "lowest in the scale of excellence," they no doubt have peculiar merits, which have fixed them in the district as the most suitable sheep for exposed mountains with excessive rainfall. Their fleece is of a character which gives it a remarkable power of resisting storms, viz., very close in texture, though withal coarse and hairy. "It is in their ability to tide through a real Siberian winter that the real blue blood of the Herdwick comes out. In a storm they are excellent generals, forming themselves into solid squares on the most exposed part of the hill until it sweeps past, and then trying to trample down the snow by a combined movement." Add to these qualities that they are much attached to their own mountains, or place of breeding, and that they "keep their heaf" better than any other kind, and one can understand the esteem in which they are held.* In another place I have had occasion to allude to an essay by Mr. William Abbot, of Coniston, which is printed in the 'New

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[*] I subjoin the Report which appeared in the 'Field' newspaper, July 24, 1880, on the Herdwicks at Carlisle. It was written by a well-known stock reporter, and represents the views of a severe critic, but there are some assertions in it which will scarcely bear examination. The height of the Cumberland ranges, for instance, is so much greater than the Cheviot hills that one need scarcely point out the fallacy of that portion of the writer's statements. The highest portion of Cheviot is nearly 600 feet less in elevation than Scawfell and from 400 to 500 feet less than many of the mountains which form the grazing grounds of the Herdwicks. Moreover, the Cheviot range is mostly rounded hill covered with fine turf, and it may well be doubted whether Cheviots

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could climb the crags of the lake mountains, even if they could endure their persistent deluges, or exist upon their scanty herbage. I am no apologist for the latter breed, but surely something is to be said for them. Mr. Leathes' statement to us was that only Herdwicks will thrive on bare mountains with excessive rainfall. The Scotch live on heather; but the Cheviots like dry bent. Perhaps the 'Field' critic has scarcely taken into account the tremendous rains by which the western mountains are visited, and which are exhausted before they reach the Cheviot range. I would further point out that "dry" cold is more easily endured by all the cultivated breeds of sheep than persistent wet with greater warmth.—H. J. L.

"The Herdwicks were in strong force for so exceptional a breed. This was to be expected, as Cumberland is their own ground. These sheep were ridiculed a good deal last year, after the appearance of some of them at Kilburn. The breeders of them in return criticised the critics, and advised them to wait till this meeting, and then study them more carefully. For our part we have done so, and our opinion of them now is more unfavourable than it was before. The breeders of these sheep contend that if Herdwicks were not kept on the Cumberland hills, no sheep could be kept there at all. They say this, however, on mistaken grounds; for when a trial of Cheviots is recommended, they reply that Cheviots are grown on lowlands, and that they would die on the Cumberland hills before they got acclimatised. This is a mistake that in these days of facilities for travelling, and of ample discussion of such subjects in newspapers, we should not have thought would be made. There are no hills in Cumberland that are anything like the height and coldness of the Cheviot hills, after which the Cheviot sheep are named. The latter are further north, and much more east besides. We have seen the Cheviots capped with snow at the end of September, and equally white at the end of May. In fact, so severe is the weather there, that if the sheep bred on them were to be taken down to lower lands for only a few weeks, they could not stand the climate on their return. The only way, indeed, that the stamina of the flocks can be kept up is by taking larger and more vigorous rams than would grow on the tops of the hills to the ewes that have been bred there. When they have done their duty, if they survive, they are taken down again. These stronger rams are bred on the lower slopes of the hills. Now, if the breeders of Herdwicks be not too infatuated with their hairy and black-spotted pets, they may advisedly procure a few ewe lambs from the top of the Cheviot hills. We say lambs, because the probability is that the Cumberland hills would be too mild and relaxing for sheep that have lived for three or four years on the higher and more bleak range in the neighbourhood of the Tweed. It would be advisable, too, to migrate these lambs at Christmas time, and, if snow be on the ground, so much the better. Anyway, this is an experiment that Herdwick men may advisedly make, at least to a small extent. Should this advice be doubted, we feel sure that Mr. W. Smith, of Melkington, Cornhill, who farms some thousands of acres of the sides and top of the Cheviot hills, will confirm our views. The Cheviot sheep at Carlisle looked in every way specimens of the result of civilisation; while the Herdwicks in every way looked like the last remnant of, we won't say barbarism, but of very ancient and primitive sheep-breeding. The judges at Carlisle confirmed this view by giving the prizes in the shearling ram classes to the sheep that had the least hair around the neck and the fewest black spots about the backs and sides; but in the older rams they had not much choice, so the prizes went to goaty-looking animals that had long black or brown ruffs of hair around their necks and long grey beards. The ewes were so small and light that a man might easily have taken one under each arm, and another in each hand, and walked any distance with the four without much inconvenience. Many of the ewes were spotted with black wool, in about an equal proportion in size and number to the spots on a leopard."—*Field*, July 24, 1880.

* See H. H. Dixon's ("The Druid's"), 'Essay on Mountain Sheep,' vol. ii. New Series), of this Journal, where much information is given.

Shepherd's Guide,' a volume which contains the marks of all the sheep in the district. Mr. Abbot's enthusiasm is almost contagious, so energetic is he in the praise of his favourites. "I am one," says he, "to argue that there is not a breed in the wide world capable of taking the place of the Herdwick. This beautiful [!] and useful animal can stand the rain and hail, can brave the strongest blasts which sweep these northern hills; and I know from experience that the intensity of the storm is often terrible. Yet the hardy Herdwick is always to the fore in the spring, ready to climb to the summits of the loftiest mountains and proudly look down on his less exalted and less beautiful fellow-creatures, the Mugs and Downs, pasturing lazily on the flats below!" In finishing his essay, so carried away is Mr. Abbot by his enthusiasm that he "drops into poetry," prose being apparently too weak any longer to express his fervour. "These sheep," he says, "may justly stand in the estimation of admirers as among the most perfect of Nature's beauties. What is there so charming anywhere in the resources of animated nature as a lovely Herdwick? Beautiful to look upon, as well as ornamental! Who would not feel just a little proud to see them rolling down the mountain breasts, at times of washing and shearing, going mostly on land where nothing else could live, with fleeces flowing, and through their noses blowing!" Having thus discovered that he has the gift of rhyme, Mr. Abbot concludes:—

"May the flocks on the mountains still grow and increase,
May their owners still live in contentment and peace;
May health attend each as through life they do go
Is the wish of the writer whose name 's found below."

To this brilliant finale I can only say "Amen!" and any further remarks on Herdwicks on my part would be superfluous.

THE PRIZES.

The Prizes for Farms which were offered by the Carlisle Local Committee were divided into four Classes:—

CLASS I.—For the best managed ARABLE or MIXED FARM above 200 acres in extent, 40*l.*; for the second best, 20*l.*

CLASS II.—For the best-managed ARABLE or MIXED FARM, not less than 50 acres in extent and not over 200 acres, 35*l.*; for the second best, 20*l.*

CLASS III.—For the best-managed STOCK or PASTORAL FARM above 200 acres in extent, 35*l.*; for the second best, 20*l.*

CLASS IV.—For the best-managed STOCK or PASTORAL FARM, not less than 80 acres in extent and not more than 200 acres, 35*l.*; for the second best, 20*l.*

In the two classes of stock on pastoral farms a condition was made that the farm was not to have more than 10 per cent. of arable land, exclusive of enclosed lands and stinted pastures.

The competition was limited to tenant farmers paying a *bonâ fide* rent for all the land in their occupation, the whole of which had to be entered on the certificate. The Judges were instructed to consider any special advantage one competitor had over another, and especially to consider—

1. General Management, with a view to Profit.
2. Productiveness of Crops.
3. Goodness and suitability of Live Stock.
4. Management of Grass- and Clover-land.
5. State of Gates, Roads, Fences, and General Neatness.
6. Mode of Book-keeping pursued.
7. Management of Dairy and Dairy Produce.

On the annexed page will be found the schedule of the farms entered. There was no competition in the fourth class (viz., Small Pastoral Farms).

The Judges did not receive their instructions in time to pay an autumn visit, and their first inspection consequently took place in February. Leaving on Candlemas Day their respective counties, Wiltshire, Yorkshire, and Cambridgeshire, all bound up with a hard and apparently unyielding frost, they found to their surprise on their arrival at Carlisle no trace of such frigidity. Ploughs were going merrily, and Spring seemed in this northern latitude to have reasserted her supremacy. But a greater surprise awaited them in the long journeys which it was necessary to take to survey the several farms. In nearly a fortnight of constant travel and much open-air inspection they were but once overtaken by rain whilst engaged upon their business.[*]

In the last week in April and the first week in May the Reporting Judge made an independent tour of the whole of the farms for the purpose of observing specially the mode of turnip-culture, the sowing of which is very early in these counties, and which is a point of great importance in their agriculture. At this visit also the district belied its character, and not until the last day of his inspection did rain interfere with work. The last visit was made by all three Judges just previous to the Carlisle Show. And again it must be recorded that they had

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[*] Starting from any given point in the district, a circuit of full 300 miles by rail and carriage was necessary to complete the inspection of the competing farms.

SCHEDULE of FARMS ENTERED for the CUMBERLAND and WESTMORELAND COMPETITION, 1880.

CLASS I.

NAME AND ADDRESS OF COMPETITOR.	Landlord.	Size.	Arable.	Pasture.	Nature of Soil.	Nature of Subsoil as described by Competitor.	REMARKS.
William Atkinson, Burneside Hall, Kendal..	S. Brunskill, Esq., Kendal ..	625	96	146? 374 Fell	Light	Principally gravel	Recommended for Third Prize.
R. G. Graham, Burnfoot-on-Esk, Longtown	Sir Fred. Graham, Netherby ..	456	355	91	Medium	Alluvial and gravel	.. ..
William Handley, Greenhead, Milnthorpe ..	G. E. Wilson, Esq., Dallam Tower	201	102	99	Light	Gravelly..	First Prize.
R. Jefferson, Preston How, Whitehaven ..	Lord Lonsdale	500	200	200	Chiefly heavy	Clay, sandstone, and magnesian limestone	.. ..
Joseph Lowthian, Winder Hall, Penrith ..	R. Gibson, Esq., Ravenstonedale	335	One-third	Two-thirds	Strong soil ..	Limestone	Second Prize.
R. Tinniswood, Rose Bank, Dalston	Ecclesiastical Commissioners..	589	405	182	Gravelly, light	"Roche," various..	Highly Commended.

CLASS II.

NAME AND ADDRESS OF COMPETITOR.	Landlord.	Size.	Arable.	Pasture.	Nature of Soil.	Nature of Subsoil as described by Competitor.	REMARKS.
William Benson, Boonwood, Gosforth	Mr. Tyson	100	60	40	Heavy gravelly	Hard freestone ..	Recommended for Third Prize.
Thomas Donald, Sandon House, Abbey Town	R. E. W. P. Standish, Esq. ..	162	145	17	Heavy	Clay	First Prize.
Thomas Kitchen, Thomas Close, Penrith ..	R. Barton, Esq.	139	130	10	Medium	Mostly red clay ..	Commended.
Executors of R. Parker, Moss End, Barton..	W. H. Wakefield, Esq.	130	82	48	Light	Gravel	Second Prize.
J. Rothery, Stanger, Cockermouth	Mrs. Thompson	79	..	..	Heavy	Very bad	.. ..
William Savage, Hanging Bank, Penrith ..	R. Addison, Esq.	145	91	54	Heavy	Mostly clay	.. ..
G. Shepherd, Meaburn, Penrith	Mrs. A. Burra	125	57	66	Mixed	Chiefly yellow sand	.. ..
James Wagstaff, Skiwgill, Penrith	Lord Lonsdale	170	100	70	Light	Gravel and clay ..	.. ..

CLASS III.

NAME AND ADDRESS OF COMPETITOR.	Landlord.	Size.	Arable.	Pasture.	Nature of Soil.	Nature of Subsoil as described by Competitor.	REMARKS.
William Leathes, Lamplugh Hall	W. L. Brooksbank, Esq... ..	1105	190	617 Fell 298	Heavy	Various, limestone	First Prize.
James Mounsey, High Lorton	R. Harbord, Esq.	750	..	750	Light	Gravel and slate ..	Second Prize.

not the same occasion to grumble at the weather which befell the visitors to that exhibition. They had thus excellent opportunities of making themselves acquainted with the merits of the several farms, and they always met with that kind-hearted hospitality and welcome which distinguishes so pre-eminently the British farmer, whilst they found every desire to give information among the competitors. The Judges were thus able to satisfy themselves on most points alluded to in their instructions, but there was one to which their attention was directed, in which the farmers of the north, as well as the south, seem to be behind the times. I allude to general neglect of correct and methodical book-keeping. Such omission by eminently practical and intelligent men is scarcely creditable, and the excuse that it is not customary with farmers to keep accounts is no vindication of the practice. I must be careful not to include all our competitors in this condemnation. Many of them had fragmentary figures which gave us much information, but only two or three of them approached any system of book-keeping by which the whole of the farm losses and profits for a series of years could be accurately ascertained. I mention this subject because at the present time it is very necessary that the attention of farmers should be called to it, and also because I think the well-educated and hard-headed men of the north are qualified to set a good example in this respect.

Many of the farms in Classes I. and II. showed considerable merit, as will be gathered from the following Report; and as there was no entry in Class IV., the Judges much hoped the Local Committee, the donors of the prizes, would consent to devote the sum offered in that class for special or extra prizes in the classes mentioned. Failing this, however, they appealed to the Council of the Society to grant some recognition of the merits of one farm in each class which they indicated, and it afforded them much pleasure to find that Mr. Atkinson and Mr. Benson were presented by the Society with prizes of 10*l.* each, which they worthily deserved.

Finally, beyond many pleasant memories and much valuable information, the Judges carried home with them a high appreciation of the excellent agriculture and industrious habits of the farmers of the two counties, and they can but express their acknowledgments of much courtesy and kindness received, to each and all of the families of the competitors; and their admiration of the qualities which seem to have been perpetuated for many generations in the district, and which, so far as human efforts can avail, have helped to save their possessors from the misfortunes which have befallen farmers in other localities.

MR. HANDLEY'S FARM, GREENHEAD, WESTMORELAND.

First Prize Farm.—Class I.

Situation of Farm.—South of Kendal the Kent river finds its way through an undulating and agreeable country till it joins the sea at Morecambe Bay, forming one of the deep sandy indentations across which the Furness Railway has been carried by its spirited engineer. Through the heart of this verdant district, which has earned for itself the title of the "garden of Westmoreland," runs the main line of the North-Western Railway, leaving on its west side Whitbarrow Scar and the other fells which rise between this valley and the Lake of Windermere, and on the east the high limestone crags which intervene between it and the Lune valley at Kirkby Lonsdale. The Kendal and Grange Railway, which leaves the North-Western at Hincaster, also accommodates the district; and close to the junction of these two lines lies Greenhead, Mr. Handley's farm, in a country intersected by a network of Devonshire-like roads, and with no very prominent features in its immediate vicinity, save the high embankments of the railway and distant views of fells and "scars."

The Vale of Westmoreland famous for its Fertility.—The land hereabouts has a reputation for its fertility, and nowhere are the turnip crops—the chief boast of Westmoreland agriculture—more successfully cultivated; the proximity of the sea producing a mildness, and the neighbourhood of the mountains a humidity of climate, to which this distinction is largely owing.

A "Shorthorn" Farm.—Mr. Handley's speciality is his Shorthorn herd, though the whole of his business is characterised by capital management. If we had not remembered his success at Kilburn last year with "Master Harbinger," we should have been left in no doubt as to his prowess as a breeder after entering his house; for a more formidable array of cups and other trophies few tenant farmers could present.

Acreage.—The size of the farm is only 201 acres, thus only just qualifying it for admission in Class I. When I say that on this limited area a herd of nearly 100 head of cattle of the very finest description, and a flock of about 200 sheep, are maintained the year round, I have stated enough to qualify it for high praise; but I must enter a little into the general management of the farm before I turn to what is undoubtedly the most interesting portion of its economy.

The farm is held from year to year of G. E. Wilson, Esq., of Dallam Tower, and has been in Mr. Handley's occupation thirteen years.

Description of Land.—There are 102 acres of arable land, and 92 of meadow and pasture. The character is described by Mr. Handley as "light and gravelly." It might perhaps be more accurately styled "stony in the highest degree." It is on the mountain limestone formation which fills up this valley from Kendal to Milnthorpe; and where there is sufficient soil this description of land is perhaps as fertile as any in the county. But the beds of stones of all shapes and sizes in which Mr. Handley's swedes were this season cultivated, would, with any other climate than this damp and genial one, probably offer very little encouragement to either the root- or the corn-grower. Here, however, the smallest admixture of the brown soil with the stones over which man and horse blunder, seems with proper management to give its fruit to the tiller of the land.

Crops and Cropping Course. — The course of cropping is generally pretty regular, viz.:

(1) about 20 A. Roots (nearly all swedes).
(2) „ 20 A. Barley.
(3) „ 20 A. Seeds grazed.
(4) „ 20 A. do. do.
(5) „ 20 A. Oats.

The swedes are capital in quality, and with Mr. Handley's management large crops are grown. The barley is good, and is nearly always sold for malting. The oats are good, but are consumed principally on the farm. The whole of the oat and barley straw is eaten by cattle. It is noticeable that no seeds are mown, but 24 acres of meadow are regularly made into hay. No hay or straw is sold off the farm.

Roots.—Occasionally a piece of land is kept down longer than the ordinary period if the seeds are doing well, and this year the piece prepared for that crop had laid in grass no less than five years. The land is subject to charlock (here known as field kale), but couch grass gives very little trouble. It is generally ploughed twice, the first time as soon as possible after harvest, and the second time in March or April, each time with two horses and to as great a depth as the soil will allow, and then ridged for the swedes, which are sown as early as possible in May, and even sometimes in April. The ridges are 30 inches apart, and are made with a double-breast plough, two horses doing four acres a day. About fifteen tons of farmyard dung are applied beneath the ridges, and in addition 7 cwt. or 8 cwt. of artificial manure. Of this latter, 5 cwt. is generally bone superphosphate and 2 cwt. Peruvian guano. When farmyard dung cannot be spared the roots get 12 cwt. or 13 cwt. of artificial manures in about the same relative proportion.

This very liberal treatment results in very fine crops, and even last year (strange to say) in this locality they were equal to the average. "Stitch harrowing" is fully practised between the ridges, and the important operation of hand-hoeing is done at a cost of 1*d.* per 100 yards for "flat hoeing," and 2*d.* per 100 yards for singling. The whole of the swede crop is removed from the land, being carted to heaps by the side of the fields and lightly protected by grass or rubbish from frost, and in compensation for this withdrawal about 4 or 5 cwt. of artificial of the same mixture as that mentioned above is sown with the following barley crop.

Barley.—The two pieces of barley this year comprised about 23 acres. The crop was very promising, clean, and the plant of young seeds excellent. The barley is always sown broadcast some time during the month of April, and Mr. Handley is inclined to wait until genial weather seems to insure a quick growth of this important cereal. A judicious mixture of seeds and grass is used. As I have said, they are always grazed, and the oats which follow are apparently as good and clean as most in the district. Ploughing of lea for oats is commenced as soon as possible in the new year. The oats are sown broadcast in March, and the land then requires three harrowings. About four bushels, or rather more, are sown to the acre. The quality of the oats grown, like the barley, is good, and they are generally in this sheltered vale harvested pretty early. Nearly the whole of the straw, both oat and barley, is consumed by the cattle.

Meadow.—The meadow land occupies the low ground on the sides of a small river which intersects the farm, and whose course has apparently been straightened. It only extended to twenty-four acres. It is of good quality, but like the rest of the land extremely sensitive to droughts. It is treated with equal generosity to the rest of the farm, getting in alternate years a dressing of dung from the stalls, and of guano and superphosphate mixed. *One or other of these tillages is never omitted.*

Artificial Manures.—It will not be surprising that under these circumstances the sum spent on artificial manures is considerable. It generally amounts to about 150*l.* per annum, which is perhaps equal to another rent upon the arable portion of the farm. This will seem an extravagant sum to many farmers, but it is compensated on this stony land by the crops raised. Our July visit revealed to us most promising crops, and although the swedes on the more gravelly portions of the farm had not grown with such regularity as could be desired, owing to the drought which followed the seed-time, but had come in two growths, there was a full plant, and the size and quality of the roots we saw in winter attested the fine character of the crop generally grown upon the land.

The Herd.—At our February visit we found no less than 97 head of cattle in the byres, divided thus:

35 Cows in-milk and calf.
15 Two-year-old heifers.
14 Yearling ditto.
24 Calves.
2 Aged bulls.
1 Two-year-old ditto.
5 Young ditto.
1 Bullock.
—
97

This for a 200-acre farm of the kind may truly be regarded as a most unusual herd in numbers, but it is not less so in character. In April this number had been lessened by only four animals, and again in July there were 94 head, of which 35 again consisted of cows in-milk and calf; 26 heifers, one- and two-year old, and 29 calves, so that these figures may be taken as the normal number of the herd. I need scarcely say that the whole of the cattle are Shorthorns, since Mr. Handley's name is so well known in connection with the breed. Many of his cattle are of the grandest description, but in reading this account I ask my readers to bear in mind that although a "Show herd" in the usual sense of the word, it is by no means one of those kept regardless of expense, or as a rich man's hobby, but on the contrary as part of a frugal Westmoreland farmer's means of livelihood and of a system adopted for "profit," and which would soon have to yield to some other alternative if it did not secure that most important essential. During the whole of Mr. Handley's tenure of the farm he has been a pedigree Shorthorn breeder. In this period Booth blood has almost uniformly been adhered to. About half the cows are entered or are eligible for the Herdbook, and the whole of the remainder have three crosses of pure blood.

Mr. Handley's Winnings.—Mr. Handley's principal successes as a Shorthorn breeder did not begin till within the last decade. Since 1870 it would be difficult, however, to compress within reasonable limits any record of his winnings. In 1871 at Kirkby Lonsdale, in a district renowned for Shorthorns, he took the challenge cup for the best bull in the yard. In 1874 he followed it up by winning at Grantham (Lincolnshire) the first prize for an aged bull ("Earl of Derwent"). In the same year he took at the Cumberland and Westmoreland Show the challenge cup for the best bull of any age, and followed up the success at the North Lonsdale, by securing the challenge cup, value 105*l.*, for the best bull. Apparently encouraged by these successes, he in the following year showed very freely, and was exceedingly successful. Cups and "firsts" seem to have poured upon him in 1875 and 1876 at all the local exhibitions, and in 1877 we find him farther afield, winning at Preston in July a first with a yearling bull, and at the Royal at Liverpool a fourth, with a heifer. And now he is "all over the place" with his stock. Preston and Lancaster, Skipton and Doncaster, Kelso and Dumfries, Worcester and Bedford, all know his name. At Kilburn he gained the first prize for yearling bulls, and now thickly follow some remarkable successes. The Kilburn yearling won at Cheltenham, Shrewsbury, Leeds, Preston, Blackpool, Worsley, Cockermouth, Lancaster, Birkenhead and many other places, and earned for his owner about 300*l.* in cups and prizes, and it is simply impossible that I should enumerate the numberless other winnings which poured in in 1879. I will at the end of this paper attempt some kind of analysis of the book which Mr. Handley has placed in my hands, but I have said enough to show that this herd has been, of late, successful in no ordinary degree.

The first bull which claimed our attention in looking over this herd was the old "Sir Arthur Ingram," bred by Mr. Linton and bought by Mr. Handley, jun., at his sale in the autumn of last year. This grand old animal, at eight years old, is still in capital working order, and was so well known in the Showyard that any description of him would be superfluous. He won three Royal firsts and three seconds, besides a great number of prizes at other shows, before he came into his present owner's hands. Although his show days are probably over, he yet retains such vigour that he is likely to make his mark on the Greenhead herd. I believe his last appearance in public was at Kilburn in 1879.

The beautiful roan "Master Harbinger," winner of the first prize in the yearlings at Kilburn last year, is still in all the bloom and freshness of youth, and apparently unimpaired by his preparation for the numerous exhibitions in which he has been victorious. The pedigree of this very successful young bull I extract from the Royal Agricultural Catalogue at Carlisle, where he was second. "'Master Harbinger' (40,324), roan, 2 years 7 months 1 week 6 days old, bred by Exhibitor; s. Alfred the Great (36,121), d. Earl's Flora, by Earl of Eglinton (23,832), g. d. Flora Cobham, by Marquis of Cobham (22,299), gr. g. d. Flower of Fitz-Clarence, by Alfred Fitz-Clarence (19,215), gr. g. g. d. Miss Nicety, by Veteran (13,941)." Mr. Handley still possesses his sire, "Alfred the Great," and this bull, a fine roan, with very good looks, has also had his share of Showyard honours.* A calf by him and with much the same pedigree as "Master Harbinger," got a high commendation and the reserve number in his class at Carlisle, and will probably be heard of again.

Another bull, to which Mr. Handley's sideboard owes much, was "Lord St. Vincent," who took many prizes as a yearling, and was shown at Kilburn last year, where, however, he did nothing.

The Cows.—But it is time that I turned to the cows. "Place aux dames!" as I have heard an enthusiastic amateur exclaim. Without going into the hysterics which most Shorthorn writers of the present day think it necessary to affect, I must record the opinion of the Judges, that they saw in February, turned out of the byres, 35 cows, nearly all of which, for size, symmetry, character and healthy condition would do credit to any herd in England.

Among the younger stock, the heifer "Queen Mary," who was also at Kilburn last year and was highly commended, could not escape observation. She also is a roan of excellent form and fashion, and is now about twenty months old. I find, however, that there were so many of the younger as well as the older cattle which challenged our admiration, that I must decline to individualise them, feeling that there is other work before me than the enumeration of those many features on which the men whose "talk is of cattle" love to linger. I shall therefore content myself by remarking that Mr. Handley, as the farmer of only 200 acres of land, may well be proud of the eminence he has achieved in this department of his business, and that he may probably challenge comparison with any herd in England owned by an occupier of equal extent.

With reference to the keep of the herd, it is needless to say that it is not done for nothing; but I shall produce figures by-and-bye which will dispel the notion that any extravagance is practised; and I wish here to remark that the younger stock get neither corn nor cake in winter, but live on swedes and oat-straw, and it is only the animals intended for show which are indulged to any extent, although the cows generally get some linseed-cake or meal together with their swedes, to the extent of perhaps 4 lbs. a day. About thirty cows are generally calved, and the calves are all hand-reared. Up to a month old they get new milk, and are fed three times a day. Afterwards they are fed on skim milk and oil-cake, or oatmeal porridge. None of the male calves are steered, a ready market being found for them when young for breeding purposes. They generally go when about a twelvemonth old. The bad breeders or inferior milkers, &c., are fattened off, and about ten or a dozen cows are quitted fat annually.

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* He took ten First Prizes as a yearling.

Dairy.—That these Shorthorns are by no means kept for show and breeding purposes alone is proved by the large dairy which is regularly maintained. The butter sold in 1879 made 282*l.* Mrs. Handley sells it herself at Kendal. Eggs and poultry in the same year to the amount of 30*l.* were disposed of, and these three items of farm-produce generally pay the rent or thereabouts.

Sheep.—A flock of Shropshires has been maintained by Mr. Handley for many years, and his successes with these at the local shows have been by no means few. On referring to the book mentioned before, I find that as early as 1861 he was in the prize list at Kendal, with some of his gimmers, and no subsequent year passed without numerous trophies from the neighbouring exhibitions; but it is only with his Shorthorns that he has scored any *national* successes. The sheep have not gone farther from home than the neighbouring counties of Lancaster, York, and Cumberland.

In 1871 some Leicesters appeared upon the scene, and since that time the two breeds have been kept up distinct upon the farm. Lately, however, the sheep, as far as exhibition purposes are concerned, have fallen in the rear, and have given place to Shorthorns. It will readily be understood how difficult, in Mr. Handley's limited occupation, it would be to maintain both flock and herd in show condition, and Mr. Handley has probably exercised a wise discretion in concentrating his attention on the cattle. Since 1877 I find little mention of his sheep in the prize lists, though when I record the circumstance that his flock has taken 159 firsts, 99 seconds, and 15 thirds, it is plain that Mr. Handley may rest on his laurels, and exclaim of them as of his herd—

> "Et militavi non sine gloria."

There were 201 sheep at our winter visit, viz., 50 ewes and 151 hoggets, gimmers, tups, &c. In July there were 182, viz.:

41	Ewes.
63	Lambs.
19	Shearling rams.
58	Shearlings, gimmers and wethers.
1	Oxford ram.
182	

It would be almost superfluous to say that the sheep were good of their sorts and that they were also healthy and well-conditioned. The general management of the flock does not present any striking features. The ewes lamb early in March on the pastures. Generally about 25 of each breed are put to the ram. These with their produce are all wintered on grass with turnips, and if the root crop is plentiful, 100 to 120 more hoggs are bought in autumn, and being well kept easily go away during the summer from grass. The Shropshire tups are very useful animals, and they find purchasers readily in this neighbourhood for crossing purposes. Of course the Shropshire and Leicester flocks are kept distinct, and the young sheep, after reserving all the best for rams and sufficient gimmers to keep up the flock, are fed off and sent away fat after shearing.

Pigs and Horses.—The pigs require no notice for the same reason as the Irish snakes—there are none; and the horses may be briefly dismissed. They are a kind of half-bred strain, with some activity. They are no doubt suited for the work of the farm, but they have no particular character. Five in all are kept, but this includes the "trap" horse for marketing purposes.

Labour.—The system of labour is the usual Westmoreland one of boarding all the men in the house, and the actual outlay in wages for the last three years has been—

	1877.			1878.			1879.		
	£			£			£		
Wages	115	10	0	108	10	0	108	10	0
Extra turnip hoeing	7	10	0	7	10	0	7	10	0
Harvest	25	0	0	25	0	0	25	0	0
Total	148	0	0	131	0	0	131	0	0

Four men, one lad, and a servant girl are kept. The best man gets 35*l.* besides his board, and they run from this sum to 10*l.* for a lad. They live at the same table as their master and mistress, and precisely in the same manner. The sum of 208*l.* is charged in the accounts for the living expenses of the whole family of nine persons. This is equivalent to 9*s.* a week each, which is a fair allowance. The total outlay for labour may be put at less than 250*l.* per annum.

Feeding Stuffs.—In the last three years the following has been the outlay—

	£	*s.*	*d.*
1877	336	0	0
1878	353	5	0
1879	285	7	0

The average has therefore been about 324*l.* 10*s.*, which perhaps seems large for the size of the farm, but no longer so if the stock and their character are considered.

Improvements.—I shall not dwell long on this subject, but since Mr. Handley has been very spirited in this line I think it due to him that some of them should be briefly enumerated. Some of the steepest of the land has been laid down in permanent grass. Large quantities of turnips have been consumed upon it, and it has been boned heavily. The following is the account of the new walling, hedging, &c. executed by Mr. Handley during his tenancy—

2989 yards of new stone dyking.
1915 „ new stone fence walling.
927 „ new quick-thorn fence.
2842 „ old fences grubbed and removed.

Hedges, Fences, &c.—The hedges and fences are uniformly good; whether quick-thorn or stone, they are maintained in a thoroughly good condition. The gates are all in good order, and are painted red. The general appearance of the farm is neat. The fields are large; the homestead (nearly in the centre) is capacious, its walls being of stone, as usual in this district; a fixed 6-horse engine threshes and cuts chaff. One of the barns is on a higher level and above the range of cattle sheds (an ordinary Westmoreland plan). The house is of the ordinary Westmoreland type, stone-built and roomy, but by no means ornamental. It would be advantageous on a farm like this, where the consumption of artificial food is large and where fine stock are kept, if the dung were kept under cover, but this is a point which few Westmoreland landlords seem to think of sufficient importance.

Prizes.—The following remarkable list of prizes taken by Mr. Handley will show that in other matters besides showing stock he has been very successful, and that the honour he has now achieved is only the crowning point of a career of prosperity. His farm has taken 7 first and 8 second pizes. For the best crops of swedes in local competition he has taken 24 firsts and 20 seconds. For "general stock," 10 firsts and 1 second. For Shorthorns, 235 first, 88 second, 21 third, and 7 fourth; and for sheep, as I have mentioned previously, 159 first, 99 second, and 15 third.

In 1879 upwards of 650*l.* were taken in cups and cash in Shorthorn prizes, of which "Master Harbinger" earned 300*l.* for his breeder. Of this sum Mr. Handley reckons 350*l.* as profit, and the remainder as cost of exhibition.

The accounts, which are very well kept, sufficiently sh what Judges in the present day ought to value, viz., that this farm has been managed strictly according to the conditions of the Society—"with a view to profit," and I trust I have succeeded in convincing readers that Mr. Handley was worthy of the high honour accorded him in the competition; and I can further assure them, were I permitted to publish accounts, that even in these bad times the balance-sheet is one which would make the eyes of many a southern farmer open with astonishment, whilst at the same time it caused his mouth to water with envy.

MR. LOWTHIAN'S FARM, WINDER HALL, WESTMORELAND.

Second Prize Farm.—Class I.

Situation.—By an almost continuous gentle ascent from the valley of the Eamont, and some five miles south-west of Penrith, lies Winder Hall. Lies, did I say? I should more justly have written "is perched," for an elevation of 900 feet is attained before Mr. Lowthian's farm is reached. Sufficient height this for tillage! but, in a district where oats and turnips are the principal crops, by no means beyond the mark where cultivation ceases to be profitable. At any rate Mr. Lowthian has something to show beyond the view, respecting which (restricted as I feel myself in devoting space to such matters), I must perforce say a few words; for, indeed, the man who could go over this farm in any weather but a fog and be insensible to the beauty of the scene could have little sense of enjoyment of any of Nature's charms. When the sun lights up the glorious landscape visible from this elevated spot it is difficult to believe that any man in England has before his eyes each day a more bewitching scene than the farmer of Winder Hall. But this extended prospect does not greet one from the house, for which, like most habitations in an elevated country, shelter has been naturally sought rather than a wide horizon; so that one must get into the fields and away from the homestead to discover the full perfection of the view. Mounting still higher, then, than the house, one approaches a rough park or pasture, a remnant of the "common" land of the farm, where oaks, thorns, and hazels still linger in copses to break the winds and to give an additional charm to the scene. From this spot what I must call an almost unrivalled view breaks upon the spectator. To his surprise he finds the lake of Ullswater lying almost at his feet, its surrounding mountains dipping their wooded sides to its shores. The bright little valley which opens from its lower end, and passes its waters by the Eamont under Pooley Bridge, is just beneath the steep slope on which he stands; but this comprises but a small portion of the landscape on which he can now feast his eyes. To the north and east lies spread before him like a map a country which from this height seems surely as attractive as almost anything England can show. The great wooded vale by which the Eden flows through Westmoreland and on to Carlisle is beneath, enlivened by a score of villages; and here and there is seen the steam which marks the great iron highway of the North-Western Railway, along which a hundred trains thunder at all hours of the day and night. Skirting this more level region, Cross Fell and the great Pennine Range stretch out into Durham, the pyramidal Dufton Fell standing out like a rampart into the plain; while, turning still farther to the south is the great mountain chain which marks the borders of Westmoreland and Yorkshire, through which the Midland Railway, scorning all obstacles, has pierced its way; and all this superb view can be had within the space of a few yards, and standing on the slope of a pasture which, in the pretty character of its broken ground, might rival some of the most famous of English parks. A more enchanting scene for picnic party or summer excursion it would be difficult to find. To add to the interest of the scene, just to the east, beneath the farm, lies the romantic village of Askham; and crowning the slopes of its rocky river the magnificent castle of Lowther, surrounded by its woods and park, stretching for miles in each direction.

I shall perhaps be censured for giving my pen free rein, and making this feeble attempt to describe a scene of surpassing beauty; but a Stoic could scarcely visit this farm without some note of admiration; and I now descend from my soaring Pegasus to notice the more prosaic attributes which distinguish the agriculture of the farm.

Size and Character of Farm.—The size of this farm is 355 acres, of which about two-thirds are pasture. It is described by Mr. Lowthian as a strong soil, but the tillage land scarcely bears out this representation; at least, a farmer of the clays of Essex or Suffolk would not admit its accuracy. Its appearance is rather that of a useful red loam, but it is near the rock, and therefore somewhat thin-skinned. It is upon the mountain limestone formation, and though situated at such an elevation, there are no steep slopes or pitches to interfere with its free cultivation.

The House.—The house is stone-built, and of manorial appearance, with mullioned windows, and an ancient hall which is used as the living-room, with a characteristic deeply set "ingle," and much dark oak in keeping with its fashi and there is altogether a pleasant old-world appearance in it and its surroundings. A stone over the doorway records the date of its erection,—1612.

Buildings.—The buildings are excellent for a farm of the size, comprising large hay and corn barns, capital granaries, ample "byre" accommodation for the cattle, and, moreover, a first-rate *covered* midden, most substantially built with stone pillars and a slated roof, which it would be well to see more generally adopted in this country of superabundant rain and deficient litter. Mr. Lowthian's fittings are in worthy keeping with this excellent homestead. A portable engine by Marshall of Gainsborough, in a galvanised shed just outside the barn, works the threshing machine, breaks cake, cuts chaff, and grinds the whole of the corn grown upon the farm, and is kept in such beautiful trim by Mr. Lowthian's son—who acts as engine-driver—that a word of praise must be bestowed upon it. The driver of a crack express could hardly bestow more pains upon the appearance of his machine, and, as far as we could judge, every part was in perfect order. Barford and Perkins' grinding mill is used, and the fittings are planned so that grinding, cake-breaking, and chaff-cutting can all be carried on simultaneously. Moreover, it should be noted that the chaff-house joins the cutter. In addition to the stone-built buildings a large corn-shed of seven bays has been cheaply run up by Mr. Lowthian at his own expense, formed of larch-poles with a galvanised roof, and with a thorough draught through each bay.

The whole farm has been remodelled and thrown into new fields with generally straight fences by Mr. Lowthian during his occupation. It is held on a yearly tenancy, and Mr. Lowthian has had it seventeen or eighteen years, his mother having been the previous lessee.

The landlord finds timber, and until lately also provided gates and paint, so every gate is yearly painted. The implement-sheds and cart-houses are good, and their contents are in excellent order.

No corn is sold. This, therefore, may be looked upon as an interesting and characteristic example of a farm where "everything walks to market."

Horses.—Six working horses are kept. This looks like a very large number, but Mr. Lowthian buys at two years old, and sells at four years or when he can make a good price, and therefore it can scarcely be said to represent the regular requirements of the farm. The horses are first-rate, of great size and substance, and massive bone. Two of them which we saw in February cost 75*l.* apiece or thereabouts as two-year-olds; as four-year-olds he was hoping to make 120*l.* or 130*l.* of them.

Besides these, a couple of nags are kept, and this comprises the horse stock.

Cattle.—A Shorthorn herd of about 100 head is kept, and they are, for the most part, most excellent animals. The stock at our winter visit consisted of

5	Bulls, young and old.
22	Cows in-milk and calf.
16	Fattening heifers.
10	Two-year-old heifers.
14	Yearling steers.
3	Two-year-old ditto.
12	Yearling heifers.
19	Calves.
101	

In July the stock was as follows:—

20	Cows.
17	Bulling-heifers.
11	Heifer-stirks.
13	Bullock-stirks.
32	Calves.
93	

The bull in use for some time past has been one of Sir Richard Musgrave's breed, entered as "Baron of Underly." He is now four years old and upwards, and is a grand animal, but white in colour. In a district of fine cattle he showed well, and would perhaps be hard to beat as a farmer's bull. Mr. Lowthian sells a good number of young bulls unregistered, and finds a fair market, as his animals are well known. The four young bulls we saw in February had all been sold on my visit in April at from 20 guineas to 35 guineas apiece, and a very pretty and well-bred animal had replaced them, which was purchased at one of the auction-sales at Penrith.

In the interval between our visits a great misfortune had overtaken the herd, a number of the cows having cast their calves. This must be one of the disadvantages inseparable from the mode of keeping cattle in Cumberland and Westmoreland entirely in byres, as it is extremely difficult to prevent its spreading when once it breaks out in such close quarters. This state of things had told upon the condition of the herd, which showed badly in consequence in April. There were, however, some very noticeable cows among them, and especially a grand roan, about ten years old, and a remarkably fine autumn-born bull-calf out of her. The bulling-heifers (which at the end of April were already turned out on the "Park," as the rough pasture I have alluded to as enjoying such a fine view is called), were also, though in moderate condition, a creditable lot. They were only getting grass, with no help even at this early season, so that they were seen in a veritable state of nature. Summer begins late on this high land, and there is not generally much grass on this "Park" till the season is well advanced. The present size of it is about 100 acres, and it will carry about 50 head of cattle during the summer season. The younger stock of the farm generally run up here.

Sheep.—A breeding-flock is not kept. Mr. Lowthian assigns as a reason for his discontinuance of this practice, that he found lime so beneficial, nay, so invaluable to the farm generally, that the whole of it has been very heavily dressed from time to time; but this application affected the milk of the ewes, and made the lambs scour, so breeding was given up, and sheep are now bought and sold according to the requirements of the farm. In February there were 300 or more of half-bred Scotch tegs—Leicester upon Scotch ewes—which had been bought at 20*s.* apiece in the autumn. They were then living upon cut swedes and chaff, with a few cut oat-sheaves, and were in very fresh condition. These sheep were kept for clipping and selling in the summer, fat. In April the same sheep were to be seen, and in addition 43 pure Herdwick wethers four years old; and in July, 241 of them were still grazing and in forward condition. This would represent, I imagine, about the ordinary stock of the farm.

Swine.—The pigs need scarcely be alluded to. Mr. Lowthian is no greater admirer of these animals than his neighbours, and his stock is represented generally by 3 or 4 white pigs fed for home curing.

Cropping.—I now turn to the cropping and general management of the farm, and I again ask my readers to remember the elevation at which the land lies. The farm-house stands at no less altitude than 900 feet. The highest part of the farm is about 1100 feet, and the Common or "Park" about this height. It lies therefore some 700 feet above the waters of Ullswater, which I have said repose just beneath it, and which are about 400 feet above sea-level. The marvel to the Judges was that good crops could be raised at this height; yet the turnips of last year (both common and swedes) were hardly excelled by any we saw, and the oats were also capital, weighing about 43 lbs. per imperial bushel.

The common turnips grown last year were white Pomeranian. They had been got off the land before the frost, and were very sound and regular-sized handsome bulbs. The swedes were also very good considering the situation.

The land is cropped thus: (1) turnips and swedes; (2) oats, and occasionally a little barley; (3) seeds, generally grazed for two years and longer, if they do well; and (4) oats. Very few seeds are mown, there being 40 acres of meadow-land for the purpose. The turnip break generally consists of about 25 to 28 acres. Half of this is planted with white, and half with swedes.

For either of these the land is not touched from its state of oat-stubble till April, when it receives its first ploughing. The whole of the spring corn is always sown before the ploughs are put in the stubbles. The land gets four ploughings in all, and a good deal of grubbing. Turnips are never sown on the high land till the 20th of May, and very often in June. It is of course ridged, and 20 loads (or about 15 or 16 tons) of manure are applied per acre, besides 9 cwt. of dissolved bones. The artificial manure costs about 3*l.* per acre; and extravagant as this may seem to the southern farmer, I am convinced that it is well spent. The turnip-crop here is the foundation of the system upon which stock-farming is rendered profitable; and to get really first-class crops a large outlay is necessary; but this is amply repaid by such roots as we found on this farm. Where no farmyard-manure is applied, for white turnips, &c., the land gets 12½ cwt. per acre of dissolved bones, at a cost of 4*l.* 6*s.* per acre.

The land is not very subject to weeds, and presents no great difficulties beyond those I have mentioned. I alluded to the fact that the farm had been limed, but I did not mention that the large quantity of from 10 to 22 cartloads per acre has been applied. It has been found exceedingly beneficial both to corn, to roots, and to grass. A large field near the house, now in grass, was nine years ago broken up, cropped, and laid down again. Mr. Lowthian declares its value previous to this was *nil.* When in cultivation it was heavily limed, and a wonderful crop of turnips was produced by this and the application of 10 cwt. of bones per acre; and this was followed by an equally remunerative crop of oats. The former poverty of the land may be judged by the fact that when first broken up there was a crop of oats not equal to the seed sown. It is now a very useful pasture, having never forgotten its treatment. I need scarcely say there is a limekiln on the farm, or these large dressings would scarcely have been applied.

Labour.—All labourers board in the house. There is one married man in occupation of a cottage, but he too gets his meals in the house. There are about fifteen persons fed in t house daily, but this includes a son of Mr. Lowthian's who is a bank at Penrith, but lives at home. With this large family it will not be surprising that Mr. Lowthian is his own butcher. Beef and mutton are the meats principally consumed. A very nice young bullock, weighing about 36 stone of 14 lbs., had been killed a day or two previous to our February visit, and if the excellent appetite caused by the rarity of the air at this elevation did not deceive us, the quality of the Winder Hall beef is indeed first-rate.

Dairy.—Butter is sold at Penrith by Miss Lowthian. It makes good prices. We find by inspection of the book that prices have ranged this season from 11½*d.* to 1*s.* 10*d.* Sometimes a fortnight's cream is churned at once, and upwards of 100 lbs. thus sold together.

I have before said that one of Mr. Lowthian's sons acts as engine-driver, and I may now add that another son goes with the horses, and two daughters assist with house-work, dairy, milking, &c. Only one maid-servant is kept. About 2 men and 2 boys, besides this industrious family, complete the ordinary labour-staff. The first of these gets 11*s.* a week, besides his cottage, garden, and board; and the others 11*l.* 10*s.*, 8*l.*, and 6*l.* respectively, the half-year. It will not be surprising then that, under these circumstances, the actual money-payments under the head "Labour" are remarkably small. Last year they were 101*l.* 12*s.*

Cakes and Artificial Manures.—The bills for cakes amounted in 1879 to 240*l.*, and those for artificial manures to 86*l.* 13*s.* When it is considered that the whole of the corn grown on the farm is consumed, these amounts, which nearly equal the rent, show great liberality of management; but we had no doubt, from the figures shown us, that such generosity is paid for. There were three years' wool in the granary, and an appearance of modest prosperity which was gratifying in these times, and which is no doubt owing to the energy and industry of Mr. Lowthian and his family. In conclusion, a ride over this farm is a pleasure in more senses than one. One's love for the beauties of Nature is not only gratified by the splendid prospect, but one feels also that the same Nature which would quickly reassert her power on those lofty hills, has been subdued and made to yield herself captive at the hand of the tiller of the soil. If any one wants a comparison of her savage with her conquered state, he can have it by looking over Mr. Lowthian's fences on to fields which have been left untouched, and which, possibly more pleasing to an artist, have not the same charm to the eye of an agriculturist. Mr. Lowthian's reign here has been characterised by vast improvements. The whole farm has been relaid in new fields and limed. Draining to a large extent has been carried out by the landlord, 5 per cent. being paid on this outlay. Good fences have been planted, and are tended with much care; coppice and whins have been gradually removed from the "Park" land, and its quality improved by liming and draining. Meadows have been limed and dunged; and last, but not least, good watering places have been made in every field, a running spring having been tapped, and an iron trough inserted at Mr. Lowthian's own expense. I must not except the gates from this category of improvements. They are all capital, made of oak, well painted, and in thoroughly good order, many of them hung on massive Penrith-stone posts, which must be almost everlasting in their wear. Most of these numerous improvements have been carried out at Mr. Lowthian's expense, but some of them with the help of the landlord, who must have an equal gratification with his tenant in feeling that their mutual efforts have been successful, and that they have won a victory in a worthy cause, by the silent and peaceful subjugation of the forces of Nature. I will only just add that the July visit of the Judges found excellent crops and great cleanliness of land, and that the stock also was in capital condition. The pastures were especially admirable for their fine sward and thick growth of clovers—caused no doubt, in some measure, by the abundant application of lime; and as a mark of the great improvements carried out here, and of the capital stock and general system of management, the second prize was unhesitatingly awarded to Mr. Lowthian.

MR. WM. ATKINSON'S FARM, BURNESIDE HALL, WESTMORELAND.

Recommended for Third Prize, Class I.

Situation.—On leaving Kendal the Windermere railway ascends the valley of the little river Kent, and about two miles from that town reaches the village of Burneside, situated just where the valley of Long Sleddale joins that of the Kent. Here, in a bright, verdant, and tolerably open country, is Burneside Hall, the farm I am about to describe; but I must first say a word about the house, which is an exceedingly interesting residence, retaining several features which denote its former importance, though Time has made havoc with its structure.

Ancient Manor.—The first mention of this manor of Burneside seems to be in the reign of Edward I.,* when its lord was

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* I am entirely indebted for these particulars to a Lecture on the history of this house, read by the Rev. G. F. Weston, Vicar of Crosby, Ravensworth, in 1867, to the Members of the Kendal Literary and Scientific Institution.

Gilbert de Burneshead. It then came into possession of the De Bellinghams, a Northumberland family, by whom it was held for at least 200 years. Seven of this powerful family lived here in lineal succession, and it was under them that it became a strong and stately residence. The main portions of the existing buildings seem to be of the 15th century, and Mr. Weston has, like an enthusiastic archæologist, traced many of the former features of the house in the remaining portions of the fabric. I do not deem it necessary to follow him in his interesting quest, and I will only mention that the greater part of the tower still remains, though the usual attempt seems to have been made to bring it down, for the purpose of using its material for the farm buildings. One of the most interesting portions of the present remains—and "what makes it a particularly valuable specimen of a border gentleman's residence"—is the outer wall of enclosure, called the Barnekin, with its entrance gateway. Of this Machell, who saw it in 1692, says: "There was a moat with a lodge and battlements, through which the ascent was." The gateway with its massive oaken gates, the porter's room on the ground-floor, and the guard-room above, are in good preservation. Inside, the house still retains many most interesting points, particularly a domestic chapel (with some frescoes still remaining on its walls) which is constructed over a vaulted cellar. But I have said enough to show that this is a place of considerable former importance, and I now proceed with my description of the farm.

Farm.—This consists of a total of 625 acres, of which 249 are old enclosed land, arable and meadow, in close proximity to the house; about 3 acres river, 6 acres wood and waste, and about 374 acres hill allotments, lying on Potter Fell, at a distance of about two and a-half miles from the rest of the farm.

The home farm is divided thus:

	A.	R.	P.
Arable	96	2	18
Pasture	110	2	29
Meadow	35	2	32

Character of Land.—The nature of the soil is light, subsoil principally gravel. It is upon the slate formation, covered with much diluvium. The land is exceedingly stony in appearance, but in this wet climate not ungrateful of good tillage, as I shall show.

River Boundaries.—The farm is bordered by the river Kent on its south-west skirts and by the little Sprint—the stream descending from Long Sleddale—on the south-east. These rivers unite at the extreme southern end of the occupation, and form a capital natural boundary of this part of the farm. Some flat meadow land lies close upon these banks, but a steep bluff or rounded knoll, of considerable height, divides these two low-lying fields and forms an attractive feature in the scenery. A small plantation at its summit, placed there for shelter, is an additional ornament to this pretty little mount. I may as well mention here that this pasture, 30 acres in extent, has been much improved by Mr. Atkinson. It had not been ploughed for forty years, but cattle did not care for it, so Mr. Atkinson broke it up, took crops—(1) oats; (2) swedes; (3) oats again—and laid it down carefully and limed it, and it is now a good sweet pasture. Mill-flat-field, was also treated in an exactly similar manner, and much improved.

The meadow called Dodrush meadow, on the Sprint, is beautifully sheltered by a high bank planted with firs, &c., and in stormy weather in summer the cows are sent down here, where they find abundant "lewth" (to use a Dorsetshire expression).

The arable land lies mostly north of the homestead and away from the river. It is of an undulating character, though not particularly steep in any portions, and is divided into fields averaging about 13 acres.

Mr. Atkinson holds this farm on a yearly tenancy, and has occupied it about 15 years. He is allowed to farm much as he likes, but sells no straw nor hay. The only corn crop produced is oats, and the whole crop is consumed upon the farm.

System of Cropping.—The country being a pastoral one, and more suited for grass than corn, the seeds are kept down longer than the ordinary period of two years common in Cumberland and Westmoreland. Here they are generally grazed for at least four years, and sometimes, if the grasses look good, for a much longer time. In other respects the course of cropping is much the same as I have described in my report of the other farms, viz., (1) oats; (2) roots, entirely swedes; (3) oats; (4, 5, 6, 7, &c.) seeds.

The result of this very light cropping is seen in magnificent crops of roots. I think I may say that of all the good crops of swedes we inspected in February, Mr. Atkinson's was the best. They were preserved by throwing two rows together and covering all but the tops with a plough, and were kept perfectly sound the whole winter by this method. The regularity and size of the bulbs was most remarkable, and the climate of this valley must be wonderfully adapted for the growth of turnips, to produce such a crop in a season which was marked by the failure of the root crop over the greater part of England.

Manure.—The swedes are grown entirely without farmyard-manure, but no less than half a ton of the best bone manure is applied to them. The field selected last year had been grazed about 10 years before the oat crop which preceded the roots. This year the field taken has been down about 7 years. After these lengthened periods of grazing, as might be expected, a large quantity of the roots of the grasses remain undecomposed, after the oat crop is removed, for the sustenance of the turnip crop. There is very little twitch, but if any lingers among the grass roots it is picked up, together with all the larger sods which might interfere with the free use of the hoe among the turnips, and converted into compost with lime. The soil when first turned up looks slightly brown in colour, but on drying assumes a very slaty appearance.

The swedes are sown about the first week in May. The manure used this season is Vickers' (Sandbach) special manure at 10*l.* 10*s.* a ton (this contains, Mr. Atkinson says, some Peruvian guano), and British fertiliser, a bone manure, at 8*l.* per ton. Supposing an equal quantity of these two manures applied, the cost at the rate I have mentioned is about 4*l.* 12*s.* 6*d.* per acre for the manure for the root-crop. Such a bill would considerably astonish the farmers of the south, but it shows the value set by a Westmoreland farmer on his turnips, which indeed are the foundation of his fortune; and the magnificent crops produced show what Nature will do in this humid climate when aided by the liberality of man.

I asked Mr. Atkinson for reliable information with regard to the actual weight of swedes produced per acre on this farm, and he gave me the following statement:—In 1876 the average weight was 27 tons; in 1877 a little over 30 tons. These are the only two years in which the crops were fairly tested, but Mr. Atkinson thinks he has exceeded the latter figure occasionally, and puts his crops, one year with another, at 30 tons per acre. The whole of the swede crop is removed from the land, and is principally consumed by cattle. The following crop of oats is generally sown in March or the beginning of April, and the mixture of seeds which is sown with it is of a very liberal character. About 23 lbs. or 24 lbs. of clovers and grasses are sown as follows:—

1½ lbs. alsike clover.
4 lbs. cow-grass.
2 lbs. red clover.
2 lbs. trefoil.
1½ lbs. Timothy.
2 lbs. meadow foxtail.
1 lb. sweet vernal.
1 lb. hard fescue.
5 lbs. cocksfoot.
½ bushel perennial rye-grass.
½ bushel Italian ditto.

These are mown the first and grazed the subsequent years of the course; and, as I said, oats are again taken when the grass fails or when a turnip crop is again required. The whole of the oat-straw is consumed by cattle.*

Horses.—Three working horses only are required, as only about one field is taken for roots each year. There is a pony besides for odd jobs, markets, &c. The horses are of a useful active character.

Cattle.—It is in this department that the farm especially shines. It would perhaps be difficult to find a better unpedigree Shorthorn herd of the dimensions of this one, even in this grand Shorthorn country. Booth blood is adhered to, and the following bulls have of late been used:—"Knight of the Garter," bred by Mr. James Close, of Holmscales (38,522); "General Burnshead" (34,000), bred by Mr. Linton, of Sheriff Hutton; and "British Baronet," bred by the Rev. J. Staniforth, of Storr, Windermere (39,500). The herd generally numbers about forty in-milk and in-calf. The cows for the most part are roans of excellent colour and quality, and with a good deal of character. Some calves have now begun to drop by "British Baronet," who is about 2½ years old. Both he and "Knight of the Garter" are good roans, with capital flesh and quality.

At our February visit 30 cows were turned out of one shed for our inspection. Of these 29 were in present milk. The entire herd numbered 94, divided as follows:—

42	cows and heifers in-milk and in-calf.
16	rising two and two-year-old heifers.
15	yearling ditto.
17	bull and heifer calves.
4	bulls.
94	

In April the number was 99; several calves had been born meanwhile, and a few sales had been effected. A yearling bull had been sold at 26*l.* 5*s.*, and two cows had made 27*l.* and 24*l.* respectively. In July there were 97 head.

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* The allotments on the fell consist of a higher and a lower one. The larger is the high allotment, which covers 326 acres. The lower one is somewhat less than 50. The higher one reaches 1300 or 1400 feet in elevation, and is a fine heather grouse-moor, very suitable for Scotch sheep. The lower one is not as much improved as it might be, and Mr. Atkinson could take a lesson from the Second Prizeman here. The view in ascending to this hill-grazing is a very delightful one, including the whole vale of the Kent as far as Morecambe Bay, and a vast extent of rugged hill ranges, as well as of verdant cultivated scenery. Perhaps scarcely anywhere in our travels did we meet with a more charming scene than this.

It will be noticed that Mr. Atkinson sells his male animals either as bulls or steers at an early age. He seldom has occasion, however, to "steer" them, as there is a good demand generally for his bulls.

A few of the calves get a little litter, but it cannot be afforded for the cows and heifers; it was therefore satisfactory to find the buildings superior to the general run in the North, where the practice of laying the cattle on the bare floor is common, and where it often leads to a filthy condition of the byres, which, indeed, cannot be avoided under such circumstances. A capital airy large square shed, with plenty of head-room, holding 30 cows, with Musgrave's iron fittings, contrasted very favourably with the low fœtid dens in which a good many of the Cumberland and Westmoreland cattle are condemned to spend their winters. This building, which is 56 feet long by 42 wide, has gangways 4 feet 8 inches wide behind each row of cows, and an additional equal space at their heads for feeding. The cows are arranged in three rows of 10, and there is an alley at the end communicating with the fodder-houses. The roof is arranged in three gables, and the building is well lighted by windows in these gables and at the sides. The floor is of stone-flags, and the iron fittings of stalls and mangers give it a light and cleanly appearance.

Butter is made of the milk which can be spared; but some milk is sold in the village, where there are a paper-mill and one or two woollen factories, which create some little demand. In February 20 cows were in milk, and 90 lbs. of butter, the produce of that week, had just been sold in Kendal, at 1*s.* 9*d.* per lb., by Mrs. Atkinson, who "stands the market" herself, and, having a good connection, can generally make top price. At my April visit the week's produce, 126 lbs., had just been sold at 1*s.* 7*d.* a lb. The cows in winter are fed on oat-straw and hay, swedes, oat-meal, and occasionally a little cake, but the outlay on this last item is not very heavy as will be seen when I come to that subject. They scoop their own swedes (parenthetically, this is not bad evidence of the quality of the roots). The dung, almost absolutely pure, is carried out into a midden, and thence conveyed in the winter to the mowing meadow and pasture land, the whole of the former of which, besides about 14 acres of the latter, is dressed every season. I have before noticed that all the dung is employed for this purpose. This year the entire field, called "Low Park Meadow," which consists of 32 acres, had been literally covered with this unadulterated excrement. I may mention that this field, which, no doubt, is largely composed of diluvial gravel, will not stand dry weather at all. Mr. Atkinson says that one week of hot and dry weather in summer is sufficient to stop the growth of grass and make it begin to "curl." *

Sheep.—Sheep come next in order, and a brief account must be rendered of them. A hundred pure-bred Scotch ewes run on the high allotment before alluded to, both winter and summer, and in the former season get no assistance, not even a little hay. There is plenty of heather, without which they would starve, but this is their principal winter food. To these ewes a Wensleydale tup is put, and the half-bred produce are again bred from. The Scotch tup follows after the Longwool has had first turn. The second-cross lambs got by a Longwool tup are made fat, if possible, during the summer, but a few sometimes remain till autumn, and have to be finished off with turnips. In April the Scotch gimmers which have been living on the lowlands at home go on to the hills for the summer with the older sheep, but some of the half-bred ewes with pairs remain with their lambs. Lambing begins about the middle of March with the half-breds, and about the same period with the Scotch ewes. The latter are brought down for this purpose, but do not long enjoy these fat commons. On April 26th I found 50 of these, with one lamb apiece, had already been relegated to their native mountain. Nineteen with pairs were being indulged a little longer. The half-bred ewes are good sucklers, and their lambs should get fat without cake. The ewes are distributed thinly over the grass in spring, and the meadow for mowing is not generally cleared till the 12th of May. The wethers and "shots" are all made off fat by the help of a few swedes given them in the pastures in winter.

There were 330 sheep in February, viz.:

78 Scotch-bred ewes.
49 ditto shearlings.
51 ditto gimmer hoggs.
97 Scotch horned ewes.
14 ditto gimmer hoggs.
6 Leicester Longwool tups.
7 fat half-bred ewes.
19 ditto wether hoggs.
8 blackfaced wether hoggs.
1 Scotch ram.

330

There was a good drop of lambs this year, and losses had been few. I found 267 lambs in April from 189 ewes, and there were 15 more to lamb; 78 ewes had couples; 7 ewes, 27 fat hoggets, and 6 fat rams had been sold since February; and the stock in July consisted of—

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* Indeed, I imagine it is only the abundant rainfall of this valley which (with artificial aids) renders it productive at all. At Stavely, a little farther up the valley, the annual rainfall seems to amount to about 65 inches, as I have deduced from eight years' records in Mr. J. J. Symons's Tables.

94	Scotch ewes.
14	ditto gimmers.
117	lambs from Scotch ewes.
120	cross-bred ewes.
50	ditto gimmers.
1	tup.
121	lambs out of cross-bred ewes.
517	

Cakes and Artificial Manures.—Where the whole of the corn is consumed it will not be expected that the outlay in cake will be very heavy, but the following seems to have been spent in the last three years:—

Years.	Cakes.			Artificial Manures.	Total.		
	£	s.	d.	£	£	s.	d.
1877	151	6	3	80	231	6	3
1878	136	9	6	78	214	9	6
1879	120	12	9	85	205	12	9

The cake used is principally linseed. A little decorticated cotton is consumed, and still less undecorticated.

Labour.—After being witnesses of the untiring industry of Mr. Atkinson's family, the Judges could scarcely wonder at the small amount of the labour-bills, but I believe few things in the report of this farm will prove of greater interest than the following figures, which show the amount spent for the last three years. I should say that a man and a strong lad live in the house, the former of whom gets 31*l.* and the latter 17*l.* wages, besides which a girl gets 16*l.*, and this completes the account! Consider this, ye midland and southern farmers, groaning under the burden of your labour-bills. Taking the cost of keeping the men at 7*s.* per week each, and the girl at 6*s.*, and reckoning half the cost of the latter's wage and keep to the farm account, the following figures are arrived at:—

	£	s.	d.
To cost of board, 2 men, at 7*s.*	36	8	0
To half cost of girl's board, at 6*s.*	7	16	0
To wages of man and lad	48	0	0
To half wages of girl	8	0	0
	£100	4	0

This for a farm which includes 96 acres of arable in rotation, and 146 of meadow and pasture! I will throw in the 374 acres of hill allotment, and consider it as workable with the rest, without additional cost of labour; but what is to be said of 242 acres of meadow, pasture, and arable, of which the odd 42 acres is in root and corn crop every year, where 40 cows are kept, and 120 lbs. of butter often made a-week, being worked with an expenditure of only 100*l.* besides the labour of the family? Simply this, that it is an additional instance of the lesson which is taught on so many of these northern farms, viz., that the willing labour of the cultivator himself, aided by a well-trained and industrious household, is to be relied upon beyond the time-service of a dozen hirelings who bring no interest to their occupation, or whose motive is to pass their time with as little labour as is possible compatible with the receipt of their wages, which they make no effort to earn. Is this too severe a picture of many a southern labourer? I think not. I have alluded elsewhere to the fact of the great wave of depression, which has wrought such havoc in the remainder of England, having passed over these Westmoreland and Cumberland farmers, leaving them almost unscathed. I cannot do better than wind up my report of this farm with the expression of my conviction that here would many a south-countryman learn lessons which he would do well to take home to himself, since it is certain that the virtues which have conduced to the prosperity of Burneside Hall and many more of these competing farms, are those which form part of the duty of all classes alike, and which may be practised in every clime and in every soil, though not necessarily always under equal conditions.

Let me add, that Mr. Atkinson possesses many cups which testify to his success as an agriculturist, some for "best general stock," some for "cattle," and one for "best managed farm," and it was with the greatest pleasure that the Judges found the Council of the Society had acceded to their recommendation and given him a third prize in this class, an honour which he well deserves for the admirable management which I have here endeavoured to describe.

MR. R. TINNISWOOD'S FARM, ROSE BANK, CUMBERLAND.

Highly Commended.—Class I.

Situation.—Rose Bank Farm, in the occupation of Mr. R. Tinniswood, lies about seven or eight miles south-west of Carlisle, in the valley of the Caldew, and about three miles from

Dalston station on the Maryport and Carlisle Railway. It is the property of the Ecclesiastical Commissioners, and forms part of the estate of Rose Castle, the seat of the Bishops of Carlisle, the park of which residence is included in the farm. The country is pretty, and the slopes of the little valley well wooded. The proximity of Rose Castle and some other gentlemen's seats, moreover, naturally render its aspect more attractive.

The farm consists of 589 acres of land, of which 405 are arable, two buildings, &c., and 182 meadow and pasture. It is held on a fifteen years' lease, with a Candlemas entry, and six years of the lease have already run. It is described by Mr. Tinniswood as light land for the most part, with a "roche" or porous subsoil, and the pasture lies upon clay and gravel. It is on the Red Sandstone formation, which covers all this part of the county, and its elevation above the sea-level varies from 250 feet in the Caldew meadows to 400 feet in the higher portions of the common land, which will be specially alluded to hereafter.

Character of Farm.—The farm consists of two portions, somewhat distinct, although it is entirely in a ring fence. The residence is not far from the centre of the main portion, and the pastures occupy all the slopes below the house to the river. Rose Castle lies at a little lower level, in close proximity to Rose Bank. But away to the north-west there stretches a considerable area of elevated land, called "common land." This, which extends to 220 acres or thereabouts, has for the most part been reclaimed from a state of nature by Mr. Tinniswood since the commencement of his lease. It was valued at 8*s.* per acre on his entry; it might probably be reasonably put at 20*s.* now, and this is entirely owing to Mr. Tinniswood's enterprise and exertions. The natural state in which a good deal of the adjoining land is still lying, sufficiently shows what was the condition of this when Mr. Tinniswood commenced his improvements. Covered with gorse and heather, and affording a precarious livelihood for a few half-starved cows or sheep, it presents a wonderful contrast to Mr. Tinniswood's well-cultivated fields. Tennyson's 'Northern Farmer's' boast is vividly recalled as one glances at this field of Mr. Tinniswood's labours:—

> "Dubbut look at the Waaste—there warn't not feeäd for a cow,
> Nowt at all, but bracken and fuzz: an' looäk at it now—
> Warn't worth nowt a haäcre, an' now theer 's lots of feeäd,
> Four-score yows upon it, an' some on it doon in seeäd."

Cropping.—The usual course of cropping of the county is followed without variation. This is—(1.) Swedes and common turnips. (2.) Wheat, barley, or oats, according to the description of land. (3.) Seeds, generally mown. (4.) Ditto, generally grazed. (5.) Oats.

To begin with the root-crop. About 30 acres of swedes are generally taken on the better land, near the house, and 37 acres, or thereabouts, of common turnips on the "common land." Besides this, about 3 acres of mangold and a few acres of potatoes are grown. The land for the swedes is prepared by three ploughings, and as many grubbings, &c., as necessary. It is then put into ridges 27 inches apart, and these ridges are split on 12 loads of good dung per acre; besides which 6 cwt. of bone superphosphate (pure dissolved bones) are applied, at a cost of about 8*l.* per ton, making about 2*l.* 8*s.* per acre for artificials. The swedes are sown about the middle of May. As dung cannot be found for the whole of them, half the white turnips are manured as above, but with 5 cwt. of bone-manure per acre; and those which get no dung get about 8 cwt. of bone manure.

About two-thirds of the swedes on the home-farm are carted off, and the remainder fed on the land by sheep.

On the common, the turnips cannot be eaten on the land in winter, as in this exposed situation it treads so readily, but they are entirely consumed where they grow in early autumn or late in spring.

The crop of swedes in 1879 was a very first-rate one for the season, and they were not injured by the severe frost. We estimated the crop which the sheep were eating in the field at our visit in February last at fully 25 tons an acre, and the quality was extraordinarily fine.

After the turnips come wheat, oats, and barley, according to the season, nature of the soil, &c. Sometimes oats and peas are mixed, and this is found a good practice. Oats are the favourite crop, as might be expected in this climate. The potato variety is grown at home, and "common" oats (a hardy sort) on the common land. About 4 imperial bushels are sown broadcast, and on the common they are always top-dressed with 2 cwt. per acre of concentrated manure, at a cost of 1*l.* per acre, as this land is not found good enough to produce a satisfactory crop without this help.

The seeds sown with the corn-crop consist of 14 lbs. of clovers and 1½ peck of rye-grass; and, after lying two years down, these are again followed by oats.

The quality of Mr. Tinniswood's oats last year was most excellent. They would weigh about 45½ lbs. a bushel, imperial, and the condition also was good.

Stock.—Farm-horses.—Nine horses are worked. They are good useful animals. They occasionally get a little help from the steam cultivators when they are behindhand with their turnip preparation. Several other horses are kept on the farm. The total number in February was 23, and in July 22. They consist of young cart and nag colts and fillies of various ages.

Cattle.—A large stock of cattle is kept, though breeding is not practised to the extent we found on some of the farms. The cattle are good Shorthorns, without anything very noticeable in their character. Only 4 to 6 cows are milked, but a large quantity of beef is made on the farm. In February we found 140 head of cattle of various ages, but principally feeders, as follows:—

34 Fattening steers.
20 do. heifers.
34 2-year-old steers.
24 Steer calves.
6 Milch cows.
4 Young calves.
1 Bull.
17 Yearling heifers.
———
140

In May there were 129 head, several of the wintered cattle having been finished and sold since our first visit; and in July the number was 133.

It would be useless with a stock of this kind to attempt to describe the method of feeding, as it varies with the cattle. In winter they are kept in byres, and get oat-straw, oat-meal, decorticated and linseed-cake, with roots. In summer they run in the parks, which are very fair land. The heifers this spring made about 20*l.* apiece, and the steers 25*l.* to 27*l.*; this will give an idea of their age and sort. About 30 acres of the park-land is mown every year, and 112 grazed. Mr. Tinniswood sometimes sells hay when he can get 5*l.* or upwards a ton, and as he cannot make down all his straw without open yards, he always sells his wheat-straw, and occasionally (but seldom) some oat-straw. About 5*d.* per stone is made of the wheat- and 4*d.* per stone of the oat-straw.

Sheep.—Breeding is carried on to a limited extent. This year there were 109 half-bred Leicester Cheviot ewes. They were bought in October at 41*s.* 9*d.* each, an excellent bargain we thought. They were ewes of a good class, and were kept up to Christmas on the grass land without any artificial help. Twelve of them were shown at Harrison's Mart, Carlisle, at Christmas, which took the first prize in their class, and also the champion prize, as the best pen of sheep in the Show. After Christmas they got turnips on the grass. They began to lamb by the first week in April, and their lambs were sold fat during the summer.

This is the general practice; the ewes are then fed off after one crop of lambs has been taken, and replaced by fresh ones. There was a remarkably good drop of lambs this year, viz., 180 lambs from 107 ewes.

A large number of tegs of the same breed, or of three-parts-bred sheep, are bought for wintering on the turnip-crop. In two fields in February we found two lots, of 245 and 205 respectively. One lot cost 27*s.* 6*d.* in October, and the other 24*s.* in August. They are fed with cut swedes three times a-day, and are moreover hurdled on swedes which they cut themselves. They get hay and some corn. At my visit in May I found 225 of the first run of tegs had gone off fat, making an average of about 50*s.* a-head, varying from 45*s.* to 55*s.*

The number of sheep kept is 500 or 600. In February there were 557 ewes and tegs. In May there were 508. In July, 522. The sheep in February consisted of 450 fattening hoggs; 107 ewes; 1 tup. In July, 254 shearlings; 99 ewes; 153 lambs; 15 shearlings with lambs; 1 tup.

Pigs.—Very few are kept. A couple of sows of the medium white breed rear their offspring, but few of the Cumberland farms are noticeable for their swine.

The average of sales of stock beyond purchases, or, in other words, the gross return from stock, or meat made, amounted for the past six years to 1335*l.* 8*s.* 9*d.*—viz. beef, 546*l.* 17*s.* 3*d.*, and mutton, 788*l.* 4*s.* 6*d.*—per annum.

Labour.—Eight men are regularly boarded in the house. Three have cottages and five are single men. Two of the cottagers have milk found for their families, one pint each per head per diem. The head man, who is also shepherd, gets 17*s.* a-week, besides his cottage and board. A horseman gets 12*s.* a-week, with cottage and board. The cowman has 10*s.* a-week, free cottage and board. Another cowman, a single man, gets 14*l.* a-half-year wages, and board and lodging in the house. The other four single men get 13*l.* the half-year, and board and lodging. I give the cost of labour since Mr. Tinniswood took the farm, as it shows a considerable increase, in consequence of the increased area of cultivated land:—

LABOUR—*from Candlemas to Candlemas*—

	£	*s.*	*d.*
1873–4	322	8	0½
1874–5	385	15	2½
1875–6	340	3	5½
1876–7	472	10	6½
1877–8	421	6	3
1878–9	420	6	2
1879–80	406	0	9

As this is a characteristic farm of the best type of Cumberland, I give the routine of daily labour. The labourers begin work at 5 A.M. in summer and 5.30 A.M. in winter. Each man cleans 20 cattle out before breakfast, besides attending to his horses. In summer they breakfast at 6, and in winter at 6.30, on porridge-and-milk and bread-and-cheese. (The head man lives a little better, and gets ham and coffee.) From Whitsuntide to Martinmas, or in hay-time and harvest, when work is pressing and it is very important to get it done, they stop for a few minutes at 10 o'clock and get some bread-and-cheese and one pint of beer each, which they carry with them into the fields; but some are teetotallers, and get milk instead. At 12 they return with their horses to dinner. This consists of fruit and suet-puddings and meat, nearly always beef or mutton. In the afternoon (in hay-time and harvest only) they again get some bread-and-cheese and sometimes beer, and at 6.30 their supper is served, which consists of milk boiled with flour in it, white bread (if they have not had it in the afternoon), and tea. One of the horsemen helps the cowman on Sundays throughout the day.

Cakes and Artificial Manures.—The outlay on these has been as follows :—

Years.	Cakes.			Manures.			Total.		
	£	s.	d.	£	s.	d.	£	s.	d.
1875–6	206	4	3	239	10	4	445	19	7
1876–7	394	10	0	636	3	4*	1030	13	4
1877–8	460	13	10	471	18	10	932	12	8
1878–9	397	18	11	392	13	2	790	12	1
1879–80	389	0	9	340	5	0	729	5	9

These figures need very little comment. I have already said that the cakes used are linseed and decorticated cotton, and the manure is nearly all pure dissolved bones. The outlay is considerable, but not extravagant. It can, however, only be compensated by good crops on the improved land, and these have fortunately been secured generally.

Buildings. — The farm premises are good and sufficient. About 40*l.* a year has been added to the rental by various improvements which have been made at Mr. Tinniswood's desire since he became tenant, and this represents an outlay of about 300*l.* I must particularly notice a very superior shed for corn, which holds about 30 stacks of the size usually made in this part of the country. I do not know the size, but it has 12 open bays, with very massive stone columns or pillars supporting a roof of timber and slate. Mr. Tinniswood carted the materials for this, the cost of which was about 300*l.* It would look very cheap in countries where such excellent materials were not at hand for its erection. Before leaving this subject, I may say that great care is bestowed upon the implements, for which a roomy shed is provided. They are kept painted up and well housed when not in use, and are in excellent condition. We noticed a machine by Reeves, for sowing corn broadcast, which takes 15 feet in width. The reaping-machines used are by Wood, by Burgess and Key, and by Hornsby.

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* 100 acres of common were in green crop this year.

I must return for a moment to the common land, the reclamation of which has so altered the character of this farm. I need hardly say that the grubbing of the whins or gorse and the reduction of the rush-bound surface was a work of some labour, and one which would have been useless without liberal succeeding management. The soil varies a good deal in character. Some of it is stony and many-coloured. Other is somewhat strong in texture, a queer greyish-brown gravelly clay with a very bad subsoil. Mr. Tinniswood says it has cropped well, but needs a good deal of stimulant. It grows very few weeds for some time after it has been broken up, but after being a short time in grass the whins prick up and make their appearance on all sides in the herbage. Couch, the great pest of so much of England, is very little trouble here, and charlock, which infests the superior land of the farm, is unknown. Sometimes a few thistles and some spurry make their appearance, but not in sufficient quantities to give much trouble. Potatoes are being tried on five acres of one of the fields, and should they be successful, this might be a paying crop on a good part of this land. They get 15 loads of dung, and 4 cwt. of concentrated manure at 10*s.* per cwt. They are planted under ridges, which are saddle-harrowed and ridged afresh as often as required. Ninety acres of this land were cleared and ploughed in one winter in the second year of Mr. Tinniswood's lease.

Whatever may be the result of this spirited management—and we have no reason to doubt its ultimate financial success—great credit is due to Mr. Tinniswood for his manipulation of this part of the farm. Corn and meat are now produced in large quantities on land which before could scarcely yield anything to the food resources of the country. The whole thing resolves itself into a question of cost, and if this land pays its way it is certainly deplorable to see a considerable portion of the upland districts of this neighbourhood still remaining in almost a natural condition. One thing is certain—the community must profit by the work; and if the cultivator does not reap a very rich harvest, he can rest content in the feeling that he has done his duty to the best of his ability by his occupation. Upon the whole, this was an excellently managed and most creditable occupation, showing great enterprise and industry in its spirited cultivator. Gates and fences were good; fields large, land clean, stock good; and if Mr. Tinniswood could not show a large amount of profit on a spirited venture—a point which the Judges were bound to consider—a satisfaction springing from improving agriculture must rest with him as he contemplates the result of his labours. The Judges had no hesitation in commending highly this very interesting farm, and Mr. Tinniswood was narrowly beaten in a heavy competition. However, the laurels cannot be plucked by every competitor, and it is no disgrace to be beaten by men who have had so much longer occupation of their holdings. *Non cuivis homini contingit adire Corinthum*, but we are much mistaken if Mr. Tinniswood does not, at some future time, go on to that complete success which, although he has failed to score this time, he is well fitted for by his pluck and perseverance.

MR. ROBERT JEFFERSON'S FARM, PRESTON HOWS, WHITEHAVEN, CUMBERLAND.

Situation.—The busy town of Whitehaven has a somewhat singular situation. It is at the mouth of an inland vale which runs parallel with the coast from St. Bees, but blocked on all other sides, except that towards the sea, by high bluffs which rise very steeply from the town itself. In ascending to Preston Hows, which lies almost due south at a distance of only two miles, one of the steepest of these hills has immediately to be faced, and an elevation of 300 feet and more is attained before Mr. Jefferson's house is reached. On the hill-top the land is undulating, but fairly level when compared with the steep which has been surmounted. The farm occupies the summit of the ridge, and is bounded on the west by the sea, towards which it gently slopes quite up to the rough cliffs which here form the coast. It follows from its elevation and peculiar situation that many attractive views are obtained from it. In fine weather the double-peak of Snaefell, in the Isle of Man, is conspicuous to the south-west, beyond St. Bees Head; whilst over the Solway, the Galloway mountains present some fine outlines. To the north, the whole of the town of Whitehaven lies at one's feet, its noise and smoke ascending on the breeze. Just beneath, to the east, runs the busy railway which carries the traffic of all the important mining region towards Cleator and Furness, whilst in the same direction the mountains of Ennerdale offer some really fine and picturesque groups.

As may be imagined, from the height and proximity to the sea, few trees are found capable of standing the gales in this exposed situation, and there is therefore an appearance of bareness which is only atoned for by the healthy situation and fine prospects.

Nature of Land.—The farm, which consists of 500 acres, belongs to the Earl of Lonsdale, one of whose residences—Whitehaven Castle—is visible below. It is held from year to year, and has been occupied by Mr. Jefferson for many years. It is mostly heavy land (for this county), red in colour, on the Sandstone formation, beneath which coal is worked in this neighbourhood. The subsoil is clay, sandstone, and magnesian limestone. About 200 acres are arable, 200 acres pasture, and 100 acres wood and waste, principally the rough ground which descends to the sea, of which Mr. Jefferson has a good two miles of boundary. The land is of good quality, yielding fine crops of corn and roots, but needing considerable care in its cultivation, like most strong land. The pastures, though so elevated, are good, and carry a large head of stock. Mr. Jefferson occupies 80 acres more pasture-land near Egremont, at a distance of six miles from Preston Hows.

There are coal-mines worked upon the farm very near the sea, under which the workings extend for great distances; one is in the vicinity of the house; and a railway incline, which carries the waggons to Whitehaven Harbour, intersects the occupation. Add to this, that almost every field has a public footpath through it, and that coal-miners are not proverbially the gentlest of human beings, and we have a certain amount of drawback even to the nearness to a good market and a large population.

Cropping Course.—The usual course of cropping adopted on the farm is as follows:—

(1.) Roots, principally swedes with a few mangolds, 25 acres; and bare fallow (the strongest land).
(2.) Wheat (if season favours) or barley.
(3, 4.) Seeds, mown first year and grazed second. (They are sometimes kept down three or four years.)
(5.) Oats.

Roots.—The land for the root-crops, swedes, mangolds, and white turnips is, if possible, manured in winter before the first ploughing. It generally gets two and sometimes three ploughings, and the remainder of the cultivation is accomplished by grubbings. The swedes are sown about the first week in May, and the mangolds somewhat sooner. The latter get about 8 cwt. of artificial (this year Mr. Jefferson has been trying Manchester sewage manure mixed with superphosphate), and are deposited in the land by finger, a small quantity of turnip-seed having been previously drilled in the ridges. The swedes get 6 cwt. of the same manure. The roots are all carted off the land, and consumed in the byres by cattle or on the grass by sheep. The root-crop last year was not an average one; this year it promises well. Mr. Jefferson was fortunate in getting all the fallow land planted with potatoes, cabbage, white turnips, or swedes, and at our July visit, like everybody else in this wonderful turnip season, had secured an excellent plant even on stubborn land naturally unsuited for roots. The turnips and swedes are singled by women or children on their knees; and Mr. Jefferson had a boy in his employment who was said to be a first-rate hand at this method. It was said that this lad could do nearly an acre a day, but half an acre is generally considered excellent work.

Wheat.—The wheat, which generally follows the root-crop, varies very much with the season, and in a bad wheat season, like 1879, the whole of it is consumed by cattle upon the farm. Barley is not much grown, the straw from wheat being preferred for bedding; but this year this crop looked promising, as did also the wheat.

Mr. Jefferson's Mixture of Seeds.—The seeds which follow these corn crops are mixed by Mr. Jefferson with much care. They consist of Italian rye-grass, 7 lbs.; perennial ditto, 6 lbs.; cocksfoot, 1 lb.; Timothy grass, 1 lb.; meadow fescue, 2 lbs.; trefoil, 2 lbs.; alsike clover, 2 lbs.; red ditto, 2 lbs.; white ditto, 2 lbs.; cowgrass, 2 lbs.; sheep's parsley, 1 lb.; total, 28 lbs.

Permanent Pasture Seeds.—For permanent grass a more elaborate mixture is prepared—a small quantity of rough-stalked meadow-grass, meadow foxtail and crested dogstail being added to the above. Altogether 40 lbs. are sown when it is intended to keep land down.

Oats.—The oats grown on the farm are entirely consumed upon the land. The straw is eaten by cattle.

Cattle.—Mr. Jefferson has long been known in the north as an excellent judge of cattle and as a Shorthorn breeder of some renown; but although he still keeps up his fancy to a certain extent, his farm is now more remarkable for the number of cattle which are annually disposed of from it, than for their quality. In the year following the dispersion of his herd, 340 fat cattle were sold off the farm; and last year no less than 250 were marketed. The proximity of Whitehaven affords a tempting opportunity to speculate in this direction, since very large numbers of Irish beasts of every variety are continually disposed of in its market; and with cows and heifers, a very short time at Preston Hows with Mr. Jefferson's good keep, puts a gloss upon them which fits them for the shambles. Good fat meat of fine quality does not seem prized by the Whitehaven community, but there is no difficulty in disposing of "half-meated" animals. To gratify this taste, Mr. Jefferson's efforts are therefore directed, and under the circumstances, viz. a good market for both the supply and demand of this description of stock close at hand, he finds this the most profitable line of business. The cattle are picked up at all prices. Less than 5*l.* is sometimes given, but 8*l.* or 10*l.* may be taken as an average price. Mr. Jefferson has a most methodical system with regard to his stock. Every animal is ear-marked as soon as it becomes his property, and entered in a book kept by him, with the date of its purchase; on its sale the price made for it is carried out in the same column, together with the number of weeks it has been on the farm, and the amount it has paid per week for its food. The beasts are all measured before they are sent to market, and the estimated price marked in a column of the same book. It is very rarely indeed that a week passes without four or six animals being sold. They are all disposed of by auction.

Pastures.—With a flying stock of this kind winter and summer (for Mr. Jefferson's pastures are of a very good feeding quality) it is difficult to describe any system. As I shall show presently, the outlay on feeding stuffs is large, the beasts are kept as long as Mr. Jefferson thinks best for "pay," and, as a rule, those kept the shortest period (as the book clearly shows) leave the most money per week for their keep.

Shorthorns.—Among the Shorthorns we found a fine bull, bred by Mr. Chrisp, of Hawkhill, called "Northern Hero," who has taken several prizes. He is about 2½ years old, red and white in colour, of capital flesh and quality. There was also an American bull, "Floridan," bought at a sale in the Isle of Man, imported when about two years old, one of Mr. Torr's "Princess" tribe; and several others less noticeable.

Cows.—Some of these are remnants of the former glories of the herd, good Shorthorn beasts of a fine type; and others moderate dairy animals, some of them only bought as nurses for the young Shorthorns. The total number of cattle in

February was 160, and in July, 180; at the latter date they were thus divided:—

22 Pure Shorthorns, in-milk and in-calf.
23 ditto young heifers and bulls.
25 English cattle in-calf and in-milk.
42 ditto young and grazing.
68 Irish grazing cattle.
———
180

Dairy.—It will be seen from the above figures that a large dairy is kept. Butter is made, and sold at Whitehaven. About 60 lbs. per week are generally made, which has fetched in the present year from 1*s.* to 1*s.* 8*d.* per lb.

Sheep.—As with Shorthorns, so with Leicesters, Mr. Jefferson is a breeder of some renown. A pure stock of Leicesters has long been kept, and rams have been sold all round the neighbourhood. Lately (like Mr. Handley) Mr. Jefferson has also gone in for Shropshires, for which there now seems to be considerable call. The flock in February numbered about 435, of which 100 were Leicester ewes, and 40 Shropshire ewes, and 175 grazing sheep of various breeds. In July the sheep were thus divided:—

57 Rams.
157 Breeding ewes and gimmers.
81 Fat sheep.
206 Lambs.
———
501

The sheep, upon the whole, are unmistakably good. The Leicesters have a good deal of character, perhaps a little "Lincolny" in style, but a capital type. The Shropshires are equally well chosen, and the flock altogether reflects great credit on Mr. Jefferson's judgment. At our July visit the lambs had been weaned, and we observed a practice which would be better were it more followed. The ewes' udders are, for some time after weaning, regularly drawn, and cheese for the use of the house is made from the milk thus extracted. The half-bred lambs (between Shropshire and Leicester) are preferred by Mr. Jefferson for his own grazing, but the whole of the lambs were good, with size, quality, and most healthy looks.

Horses.—There are 8 workers of a fair sort. Besides these there were, in July, 3 yearling colts and 2 hackneys.

Meadow.—There is a fine meadow of 50 acres near the sea. A great deal of cake is regularly consumed upon it, but it does not get much manuring.

Hay and Straw sold.—A little hay and straw is sold; the latter only when it makes a good price, say 3*l.* or 3*l.* 10*s.* a-ton.

Artificial Foods and Manures.—Besides all the corn which is consumed, about 1000*l.* a-year is spent in cakes and artificial manures. Considerable quantities of maize are used. The favourite cakes are cotton, rough and decorticated. Mr. Jefferson's system must be one which keeps the land in a high state of fertility; and a very large return from the farm is necessary to pay the outlay I have mentioned, besides the cost of the home-grown corn.

Labour.—Three men are kept in the house, and their wages amount to 100*l.* About 450*l.* in addition to this sum is spent on out-door labour. I have pointed out the advantages and disadvantages of the close neigbourhood of the farm to Whitehaven. Not the least of the latter is the price occasionally paid (in good "trade" times) for labour. A few years ago 5*s.* a-day was the ordinary wage, and all the operations of the farm were consequently very costly. At the present time women can be had for turnip hoeing or singling at 1*s.* 2*d.* a-day, and ordinary labourers at 4*s.* The labourers who have cottages get 18*s.* a-week, besides their free house and garden.

MR. R. G. GRAHAM'S FARM, BURNFOOT-ON-ESK, CUMBERLAND.

Situation.—A few miles to the north of Carlisle at the head of the Solway Frith, and formed by the streams which discharge themselves at this point into its waters, lies a tract of land which presents a remarkable contrast to the remainder of the counties of Cumberland and Westmoreland. A large extent of flat alluvial land presents itself to the eye, unredeemed by any of the scenic features which render a large portion of these counties so attractive. One might here fancy himself transported into the fens of Lincolnshire or Cambridgeshire with a very slight effort of fancy. The agricultural eye might note the difference of the prevailing crops, but otherwise it would require an observant traveller to detect much further contrast between the lands which lie at the embouchure of the rivers of the "Wash" and those which skirt the Solway. Both have been formed in the same way. Each represents the robbery which Nature for countless ages has inflicted by her silent forces on the patient hills of the upland districts. The Esk, descending from the eastern hills of Dumfriesshire, joined by the Liddel, which forms one of the chief streams of Roxburghshire, unite at the exact junction of England and Scotland, just beyond Netherby, and after a short course farther south the Cumberland

"Lyne," a considerable stream flowing from the moorland districts in the north-east of the county, unites its waters with those of these rivers just before they reach the Solway.

Hedged in by the angle at which these rivers join one another, and protected to some extent from their treacherous embraces by dykes or banks, lies the farm I am about to describe, occupied by Mr. Robert Graham, and designated "Burnfoot-on-Esk."

It is situated about 2 miles south of Longtown and 7 or 8 miles north of Carlisle. It is in the parish of Arthuret, in the quiet churchyard of which village rest, together with the remains of many more of his family, the ashes of the great statesman Sir James Graham.

The Caledonian Railway runs very near to it on the west, the North British almost touching its skirts on the east; but its exact locality will be better indicated to many of my older readers by informing them that within about 2 miles to the north-west lies a village of renown, called Gretna. When I have further said that it is part of the famous Netherby estate, I have finished my introduction.

The farm was held from 1835 to 1875 as part of the large holding of Mr. Thomas Gibbons, whose name and person are familiar to all the agriculturists of the North. During his occupation it was entirely laid out afresh, and under him it became remarkable for its crops of roots and corn, and for the goodness of its stock. On Mr. Gibbons' retirement in 1875, Mr. R. Graham (his nephew) became the tenant, having taken a lease of seven years, which has now but two years to run.

Size and Character.—The farm consists of about 456 acres, of which 355 are arable, 90 permanent pasture, and 10 water and gravel (the foreshores of the rivers which skirt it, as well as half their streams). It is, as I have said, perfectly flat, and the soil is entirely alluvial, of great depth and fine quality. It is a loam with enough but not too much adhesiveness in its character.

Cropping.—The course of cropping is as follows:—

1. Roots (chiefly swedes).
2. Wheat or barley.
3. Seeds for mowing.
4. Seeds for grazing.
5. Oats.

The average acreage of each crop is therefore about 70 acres, except of seeds, of which it is 140 acres.

Roots.—Beginning with the roots: the oat stubbles generally get two ploughings, about 7 inches deep, with a pair of horses, the first in winter and the second early in spring, and as many grubbings as required to free them from couch grass (which is not extinct in this locality). Sometimes the cultivator alone is used after one ploughing. They are then ridged at 28 inches apart, and get about 12 loads of first-rate dung per acre for swedes, and nearer 20 loads for mangolds, of which only about 4 acres are annually sown. About half an acre is generally sown with carrots, and this completes the break of root-land. The Yellow Globe mangolds are preferred on this farm, in contravention of the usual practice of the district, which is to sow Long Red. But the mangold crop is a very unimportant one here. Probably, on the average of years, a greater bulk of swedes can be obtained than of mangolds, and therefore only a few are grown for use at the extreme end of the season. A few Pomeranian white turnips—about 7 or 8 acres—are also grown for early use.

The swedes, in addition to the farmyard-manure, get about 8 or 10 cwt. per acre of superphosphate and half-inch bones mixed at the time of sowing, at a cost of about 3*l.* 3*s.* per acre. (The bones cost 7*l.* 15*s.*, the superphosphate 3*l.* 18*s.* per ton.) They are cut out fully 10 inches apart in the rows, and a very large weight is generally grown per acre. Probably here, if anywhere, such crops as we sometimes hear talked of might be realised, but at any rate great crops are grown, and in a good season 30 tons should be within the mark per acre. The swedes are generally sown before the middle of May; and the white varieties are finished by the beginning of June. About half the roots are removed from the land for the cattle in the yards, and the remainder consumed by sheep upon the land. Wheat follows on a good deal of this break, though barley is sometimes taken. The wheat seldom gets sown before March. About 3⅓ imperial bushels of wheat are broadcasted. The sort is generally Chidham, and the very high average of 39 bushels per acre is reached. It is seeded down with 12 lbs. of mixed clovers and ¾ bushel of rye-grass per acre, principally Pacey's perennial.

The seeds, as intimated, remain down 2 years, being mown the first and grazed the second season. They are then broken up and sown with oats broadcast, about a sack an acre, and this completes the course. Mr. Graham thinks his average crop of oats is about 7 quarters imperial. They generally weigh about 42 lbs. a bushel, and are of good quality. Potato and Sandy are the two sorts preferred. Fully two-thirds of the oats grown are consumed upon the farm, but the wheat and barley is all sold.

Live Stock.—It is important to notice that no sheep are bred upon the farm. This is in continuation of the practice of Mr. Gibbons. No doubt the land, like all of a similar character, is ill-adapted for the purpose; but in these days, with store stock almost uniformly dear, and with a large breadth of turnips and new seeds, it may be questioned whether Mr. Graham would not find his profits increased by departure from the old rule, even if he could not winter the lambs produced. As the sheep are all bought in, they are of varying classes according to the markets, but "three-parts-bred" sheep are preferred. This is the northern expression for two crosses of Border Leicester on Cheviot, which probably form the most useful class of sheep that can be fed in this locality. Considerable numbers of these tegs are bought in spring for the grass and seeds. They are clipped and sent off fat, but some may be left sometimes to finish with turnips. Others, again, are bought for the turnip-eating, and these should go in spring, clipping about 7 or 8 lbs. of wool apiece. The sheep we saw were of a very good class, and numbered in February 300, in May 400, and in July 310.

Cattle.—In this department of stock-farming breeding is carried on to a considerable extent. The number of cows milked varies, but there may be generally about 16. These are all Shorthorns of a good type and bred on the farm. I need hardly say that pedigree bulls alone are used. The animal at present in use is an Oxford bull got by "Duke of Kirklevington," dam "Rose of Oxford" by "Barrington Oxford."

The stock on the farm at the visit in February consisted of—

21 Cows and heifers in-milk and in-calf.
34 Feeding bullocks, heifers, and cows, bred on the farm (would average about 3 years old).
30 Two-year-olds for summering.
28 Yearlings.
2 Calves.
1 Bull.

116

In April there were 103.

The cows get turnips and oat-straw in winter, but no cake, and seldom meal. The feeding-bullocks and heifers get the same, with the addition of meal or cake. There are some feeding-pastures on the farm, and consequently fattening is carried on both in summer and winter. The cow-pasture near the house carries a cow an acre, which will give an idea of the quality of the land. The stock is very good upon the whole, and does credit to the farm.

Horses.—Four pairs of cart-horses are worked. They are of the Cumberland breed, with a good deal of Clydesdale character. They are very good animals, and there must be a great deal of work for them on a farm of this size. But steam-cultivation is sometimes practised in the autumn in preparing the stubbles for roots. Mr. Graham is also fond of a little bit of blood, and keeps a brood-mare or two, which have bred him some good stock.

Labour.—The system of labour was, until the last few months, that which is almost universal in Cumberland. The men (married or single) were all boarded in the house. As there are some cottages upon the farm, some of the labourers were of the former class, but they, equally with the single men, get their meals in the house. The ploughmen come at 5.30 in the morning in winter, and about 5.0 in summer. After the horses are done, they help to remove the dung from the byres, carrying it all out on hand-barrows, and depositing it on the midden, which occupies a prominent and important position in the courtyard, on to which the house abuts at the back. Much attention is paid to the dung-heap on this farm. A liquid-manure tank is placed underneath it, with a pump which rears its head through the centre of the midden, and the liquid-manure is daily pumped from this tank, and spread on the various portions of the heap. The olfactory organs are therefore made fully aware, on approaching the premises, of the strength of the article thus manufactured.

After the byres are cleared, breakfast proceeds, the men getting at this meal oatmeal-and-milk porridge, and bread-and-milk in addition. They return with their teams about mid-day for an hour and a half, which is occupied in feeding their horses and getting their own dinner. This consists of broth, meat (always beef or mutton) and vegetables. In summer they sometimes get tea carried into the field to them; but in winter their supper takes place at 6 o'clock, when they get milk boiled with flour, and bread-and-milk. After this they stay another hour to finish the horses and stock for the night.

The regular staff consists of—

4 Horse-men.
2 Cattle-men.
1 Shepherd.
1 Labourer (spademan, hedger, &c.).
1 Groom (odd-man and useful).

Nine men are therefore fed, on the average, every day. The wages paid are as follows:—Ploughmen get at the present time 10*s.* per week in addition to food; house and garden rent-free; firing carted free; and a cartload (about 100 stones) of potatoes free. No beer is given except in clipping-time, hay-time, and harvest. There is no bondaging, but the wives of the labourers generally get work in summer, and they have first turn in this respect. The women get 1*s.* 3*d.* a day. The actual outlay in *wages* is therefore (as on all these northern farms) very small, amounting to about 350*l.* per annum on the average.

Cakes and Artificials.—About 50 tons of cake were consumed in 1879, most of which was Earles and King's linseed-cake from Liverpool, and some decorticated cotton-cake is also used on grass; but the quantity will be a good deal reduced in 1880, in consequence of the badness of the home-grown corn, and therefore its increased consumption.

Upon the whole this is a farm which will bear a considerable amount of inspection. The land is good, the fields are large and well laid out, and the production of corn and meat is considerable. The stock is, generally speaking, good, and the hedges and fences are fairly kept. Some very good three-parts-bred sheep were bought at Penrith Fair at 58*s.* apiece. The wintered sheep were also a good class, and well done.

Mr. Graham was, however, unfortunate enough to suffer very heavily from the severity of the frost in early winter. A large quantity of swedes were carted after the first frost in November, and were almost entirely destroyed. Those left on the land were also desperately injured. On none of the other farms did we find anything like the injury done; and this was, perhaps, owing partly to the nature of the soil, and partly to the lowness of the land, but also, no doubt, to some extent, to want of timely care. Had the roots been treated like some we saw, a very fine crop for the season (as they unquestionably were) might have been saved, and a sad and deplorable waste prevented. Moreover, in July the wheat-crop also was most unpromising, a large portion of it being exceedingly thin and weedy. The meadow-land which is mown is well treated. A very heavy dressing of compost (road-scrapings and ditch-cleanings, mixed with abundance of lime) had been carted on it in the winter, and at the Reporting Judges' spring visit it showed its gratitude by a more bountiful promise than we found elsewhere.

One word in conclusion. It seemed to the writer of this Report that the farm had by no means the protection it deserved from the incursions of the neighbouring rivers. A Scottish raid in the present day could scarcely work greater havoc than is occasioned sometimes by this cause. I began by a comparison of this land with that of the lower districts of Lincolnshire, but a fenman would stand aghast at the frail protection afforded by the banks or "dykes" which are here thought sufficient for defence. The rivers which unite here are rapid streams subject to sudden rise, and, to increase the danger, they meet at this point the tide of the Solway. Backed up in this manner they may, and often do, become exceedingly dangerous neighbours, and it is astonishing to a fenman like the writer that more care is not bestowed upon these banks. A few years since, on May 24, a flood occurred which swept over several portions of the farm, and reached the sills of the chamber-windows in the cottages; but this was only one of many such occurrences within the memory of Mr. Gibbons. Useful as is the proximity of these clear and rapid streams for the stock on the farm, their danger is sufficiently evident, and, if the owner of this fine estate were so minded, I feel confident this valuable land could be rendered more secure at a moderate expense.

It perhaps hardly comes within the province of a report of this kind to notice the *feræ naturæ* of the farm, but I must put on record the opinion of the Judges that this farm is considerably injured by hares. I myself counted twenty-four hares in one field in April, and that without entering the field at all. Many more might be crouching unseen. Moreover, the roots in winter were very much bitten by them. I only allude to this subject in order that the attention of the owner may be drawn to it, as a point on which he, no doubt, is in ignorance; and I am sure that he will thank me for this allusion.

I have reported rather fully on all these farms in Class I., as all of them possessed some special points of interest. I now come to Class II., farms under 200 acres, in which the competition was exceptionally good.

MR. DONALD'S FARM, SANDEN HOUSE, ABBEY TOWN, CUMBERLAND.

First-Prize Farm.—Class II.

To Mr. Donald was awarded the First Prize in the Small Farm Class, the Judges being of opinion that, considering all points, it displayed greater merit than any other, though it need not be disguised that the first four farms in this class were well "in the running," and that the competition was a worthy one.

In the first place Mr. Donald has not the advantages of soil possessed by some of his competitors. The cultivation of clay land is attended by many difficulties in Cumberland, partly caused by the climate and partly by the lateness of the season. But Mr. Donald's farm is most of it of a decidedly heavy character and wants very careful cultivation, and is, moreover, not naturally very fertile. The tenacity of a good deal of it may be inferred from the fact that it is necessary with winter crops to put it in stitches of 9 feet or thereabouts for the purpose of surface drainage. Again, he has not the advantage of so large a proportion of pasture-land as most of his competitors; out of 162 acres only 17 being meadow or grass. Yet with these drawbacks, he exhibits a little farm which is well worthy of a visit, and which shows every sign of careful cultivation together with first-rate stock in every department.

Situation.—Sanden House is just on the outskirts of the village of Abbey Town, 6 miles east of the little port and watering-place of Silloth, and 15 or 16 west from Carlisle. The country is uninteresting. Flat marshes extend towards the Solway, which is only at a very short distance, and there are peat-bogs in the vicinity which remind one of Ireland. The farm is bounded on its north-eastern corner by the little river Waver, and an isolated meadow lying on the other side of the village is quite in the flat marsh formed by this stream. Besides the meadow there is another off-lying portion at a short distance, consisting of two small fields of very peaty land, quite fenny in character, and the lower part of which is under the serious disadvantage of being liable to flood. The remainder of the farm is compact and lies pretty well for drainage, at a slight elevation above the village, and sloping on the north-east towards the marshes.

Tenure.—The farm is held on a yearly tenure of R. E. W. P. Standish, Esq., of Marwell Hall, Winchester. Mr. Donald has liberty to crop as he likes, with the exceptions that two white crops cannot be taken in succession, and that he must not sell hay or straw, or roots, off the farm. The before-mentioned meadow cannot be broken, but all the remainder of the farm is "arable," though as a matter of convenience a field of eight acres near the house is kept in permanent grass. The farm has been in Mr. Donald's occupation since 1863.

The fields vary in size from 5 to 16 acres. It is therefore not easy to keep the cropping quite uniform, but two fields, say 14 or 15 acres, are generally fallowed each year, and this operation is followed by wheat.

Cropping.—The fallow crops are various, according to the nature of the soil, and there is generally a portion of dead fallow, necessitated by the character of the soil. Swedes, cabbage, white turnips, rape, mangolds and potatoes are all taken, but some of these in very small quantities.

The whole of the root-crop is removed from the land, which, as I have said, is sown with wheat (as the land will not grow barley of good quality). This is seeded down, and generally mains down two years, after which potato-oats are grown.

t sometimes Mr. Donald keeps the seeds down for a longer
iod than two years, and the cropping list which I subjoin
l show what proportion of the farm is at present in seeds or
p :—

	A.	R.	P.
Wheat (sown down with seeds)	14	2	36
Oats (out of lea)	21	0	38
Potatoes	3	0	0
Swede turnips	9	2	36
Other fallow crops, rape, turnips, &c.	9	2	0
First year's seeds for hay	24	0	0
Second „ (grazed)	20	2	0
Third „ „	22	0	0
Fourth „ „	7	0	0
Fifth „ „	5	0	0
Meadow for mowing	9	3	29
Permanent pasture	8	1	18

The land sown with rape this year is one of the off-lying
ces which I have mentioned as peaty in character. In fact it
xactly like the Cambridgeshire fens. Not being suitable for
nips, rape is here found to answer remarkably well, and Mr.
nald gave us an instance in which his crop made 5*l.* per acre
feeding purposes in 1875, at 7*d.* per head per week. It is
n early in June, and is manured with 12 loads of farm-
d-dung per acre. Part of this peat-land was planted with
ngolds, but like all the crops of that root in this country, they
re very indifferent, having suffered from the maggot which
ms to infest the North of England. This creature settles
the leaves, eats out their ribs and entirely prevents growth.
did not find a piece free from its ravages in the two counties.
e mangolds here get 22 loads of manure an acre and 2 cwt. of
e dissolved bones, and deserved a better fate. The potatoes,
vever, on this description of land were very promising. They
re Skerry Blues and Champions. They get a large quantity of
nyard-manure, but no artificials. The cabbages on the same
d were good, and the white turnips (at our July visit already
out) an excellent plant. The other swedes on the higher
tion of the farm, though not nearly so forward as many we
, were good in plant, and, for such unfavourable land, very
mising. This piece had just been drained, which Mr. Donald
s it much required. It is quite strong land, a clayey loam
hout a stone in it, and consequently stubborn working. In
paring the land for swedes, the oat-stubble is ploughed before
ristmas, so as to be pulverized by frost. I should mention
t Mr. Donald does not find it answer to sow swedes earlier
n May 20th, and they are often put in in June (up to the 6th).
lowance was therefore made for the somewhat backward con-

dition of the crop. The land generally requires two or three spring ploughings in addition to the autumn one, and a great deal of grubbing and "Crosskilling" before it can be got ready for sowing. About 12 loads of manure are put in for this crop per acre, and in addition 3 cwts. of dissolved bones, at 8*l.* 10*s.* per ton. The whole of the root-crop is removed from the land, and principally consumed in the byres.

Wheat.—Wheat, as I have said, is the favourite crop to follow these various fallow operations. The sort sown is Creeping White, and if anything could display Mr. Donald's management to advantage it would be the condition of the crop growing in July. This piece was after fallow, turnips, potatoes and mangolds. If the wheat sowing cannot be completed before November 11th (Martinmas) it is not persevered with, any later seeding not succeeding properly. It should begin by Oct. 10th. The wheat in question was a piece which, take it throughout, might compare favourably with the best of the crops in many a famous wheat county. In examining the few wheat-crops which came under their observation in Cumberland and Westmoreland, the Judges were in no doubt as to the wise discretion exercised by most of the farmers in these counties in practically abandoning its cultivation. On one or two farms where wheat was grown, though forward and very promising in appearance in February, it had a disappointing aspect in July. The most we could estimate several of the wheat-crops we saw in driving about the counties was 3 qrs., or at the very utmost 3½ qrs. per acre. But this crop of Mr. Donald's was so different from anything which we had before seen that we were led to a close examination of it, which resulted in a most favourable augury. Although very long in the straw, completely hiding a tall man when he walked in the furrows, it was stiff and erect; as thick as it would stand upon the ground, perfectly clean and with a long well-filled ear. I do not think that with a favourable harvest period it would be too much to estimate the crop on the upper portion of the ground at 6 imperial quarters an acre, and on the lower part, where it was not as thick, at 5 quarters, and I should be surprised to hear that it had yielded less than this.

Seeds.—The seeds which follow generally come favourably among the wheat. About 10 lbs. of mixed small seeds are sown, and 6 gallons of Italian and common ryegrass. They are mown one year, then grazed till broken up. This year they were as good a plant and as full of clover as most we saw, and I may therefore mention that cowgrass and alsike are both used, in addition to the red and white clover.

Oats.—The oats out of lea were good for the land. A heavy seeding is necessary, and five bushels of potato-oats are sown with the drop drill. The whole of the oats grown are consumed upon the farm.

Live Stock.—I now turn to the stock, in considering the whole of which Mr. Donald perhaps excels even the first-rate competitors who came against him in the class. The cattle are very first-rate; the sheep excellent, as far as they go, though this is no sheep farm; the horses superior, and the swine equally so.

The following was the stock of cattle at our February and July inspections:—

February 3rd.		*July 9th.*	
2	Bulls.	1	Bull.
3	Fat cows.	17	Cows.
17	Cows in-milk and calf.	9	Two-year-old heifers.
2	"Back-end" calves.	10	Yearling ditto.
7	Heifers rising 2 years old.	5	Bullock-stirks.
12	Yearling heifers.	15	Calves.
6	Steers.		
1	Calf.		
50		57	

The whole of the herd are pure Shorthorns, though not entered in the Herdbook. Great care is taken to maintain the superiority of the stock, and none but first-class pedigree bulls are ever used.

At our February visit we found a rare good Northumberland-bred bull in use. In July he had been replaced by a young roan of the celebrated Kilhow blood, with a "Waterloo" descent. His sire was "Wigton" (35,995). This bull was by "Grand Duke of Lightburne the 2nd," who went back to "Waterloo" blood for generations. This youngster worthily replaced the capital old bull he succeeded.

The cows and heifers mostly calve in February, March, and April. They are a rare stamp of stock, even in this splendid Shorthorn country. Their condition also leaves nothing to be desired, and they were perhaps shown to us in the byres and stalls in a more cleanly state than those of any other competitor.

Dairy.—Until the time of calving the cows do not live very luxuriously. They get oat-straw and swedes, and about 2 lbs. of crushed oats a-day. After calving they are fed a little better, palm-nut meal and linseed-cake being added to their food. The dairy is an important consideration, it need scarcely be said, and the cows are selected partly with this in view. There is a sale for a certain amount of new milk in the village at 3*d.* per quart, and a large quantity of butter makes a fair price.

The two-year-old and yearling heifers were first-rate. It would be difficult to see a more engaging lot. Admirable alike in quality, in colour and condition, they were a credit to the farm and to the breeder. Yet they are not highly kept, and running in summer on this by no means superior land, they get no help in the way of cake or meal. The calves are equally good.

Sheep.—So far as the sheep go, they are equally good with the rest of the stock. Mr. Donald can sell a few tups at home, and he therefore keeps a small number of breeding ewes. They are a Long-woolled sort, bred down by a Lincoln tup from a Blue-faced Leicester ewe. They have perhaps more of the Longwool character about them than the Leicester. This year there was a fine crop of lambs. In May I found 17 ewes with no less than 30 lambs. There were two triplets and lots of pairs. The tup lambs are not castrated, and are sold as lambs at about 3*l.* apiece.

Stints on Marsh.—Mr. Donald has four stints on Skinburness and Calvo marsh, and for each stint sends 2 ewes, with a couple of lambs apiece, and a gimmer. In July there were 62 sheep, viz., 1 tup, 22 ewes, 32 lambs, 7 gimmers.

Horses.—Five horses are generally worked; and, as breeding is successfully practised, a sixth is occasionally needed to get over the heavy work in spring. The horses are very good, of a kind of Clydesdale strain. Three mares were in-foal this year by "Simon Pure," a good Clydesdale horse, brought by an Entire Horse Society into the neighbourhood. There were in February 10 horses in all on the farm. In July this number had been increased by the 3 foals, which promised remarkably well. There were at this time 3 mares, 3 foals, 2 three-year-olds, 2 two-year-olds, 2 yearlings, and 1 driving-horse. The horse-stock have more bone than is common in the country, and with size combine quality and activity.

Pigs.—Pigs are so little considered on many of these farms that I have scarcely in some of the reports thought it necessary to allude to them. On this farm they form no exception to the uniform excellence of the stock. They are of the Middle White breed, and although not many are kept, what there are are first-rate.

Meadow.—The meadow before mentioned is a good one, but very late. It is not generally fit to mow until August.

Labour.—Three men are generally employed, viz. 2 ploughmen and a stockman. The latter gets 16*s.* a-week and a cottage free, but no extras. The head ploughman gets 18*s.* a-week and a cottage rent-free. The other horseman lives in the house, and gets a wage of 12*l.* the half-year in addition to his board. Sometimes an extra day-labourer is employed, when he gets 1*s.* 6*d.* a-day and his food. Women get 1*s.* 3*d.* in winter and 1*s.* 6*d.* in summer, and in harvest their wages vary from 2*s.* 6*d.* to 3*s.* 6*d.* and even 4*s.*

Rates.—I may just remark *en passant* that we found Mr. Donald more highly rated than almost any of the farmers in the competition. Besides a poor rate of 1*s.* 6*d.* in the pound, he paid a school rate of 1*s.* 4*d.* in the pound, and a highway rate of 6*d.* This is such an unusual charge in lightly rated Cumberland, that I have made an exception in mentioning it here.

Hedges and Fences.—The hedges and fences are generally superior to the ordinary run. They are mostly quick-thorn on banks, according to the custom of the country. The gates are fair. The buildings are good and well kept. Mr. Donald had a fire which destroyed a portion of them soon after he had entered his farm for the Competition. They were, however, quickly rebuilt, and the inevitable fixed threshing machine replaced. Threshing is done by horse-power, the horses working under shelter.

Stacks.—The ricks were very neat, well put together and well thatched, offering a decided contrast in this respect to some in this class. The farm implements were all in first-rate order, and the carts well painted and otherwise taken care of.

This concludes my notes of an interesting farm. Mr. Donald's accounts, like many more in this class, were not of an elaborate character; but we saw enough to satisfy us that, without the advantages of some of his rivals, he grew good produce, reared good stock, and presented his farm in a thoroughly neat and business-like condition which was alike creditable to his industry, his judgment, and his business capacity.

EXECUTORS OF ROWLAND PARKER, MOSS END FARM, WESTMORELAND.

Second-Prize Farm.—Class II.

Situation.—Moss End Farm, the property of Mr. W. H. Wakefield, of Sedgwick, is situated in the fertile district before mentioned in connection with Mr. Handley's farm at Greenhead, and is only 2 or 3 miles from that occupation, 7½ from Kendal, and about 4 from Milnthorpe. Like the First-Prize Farm in Class I., its neighbour, it is only moderately elevated above the sea, its highest point being just 200 feet, and the land near the house being about 130 by the Ordnance Map. The Kendal and Lancaster Canal intersects the farm, and a road of some importance in former days—the main turnpike road between London and Edinburgh—runs past the house. To the west extends the undulating country (perhaps the richest and best cultivated in Westmoreland, judging from what we saw of it) as far as the estuary of the Kent; and to the south-east rises Farleton Crag, and the other high limestone fells which rise between here and Kirkby Lonsdale. It is on these and a few contiguous hills alone that the "Limestone" sheep, which Mr. Parker's Executors still continue to breed, find their native home.

Fertility of District.—I have before said that this district is called the "Garden of Westmoreland," and it seems to deserve its reputation. Its culture is excellent; its land far better in quality than its appearance betokens; and its climate, to which no doubt in a great measure it is indebted for its fertility, is everything which can be desired for the method of cropping adopted. In turnip cultivation, especially, it is famous, and it may be doubted if any other part of England can beat, if indeed it can equal, this particular district in this branch of agriculture.

Tenure.—The farm has very long been in the occupation of Mr. Parker's family. The late Mr. Parker occupied it for no less than forty-eight years, and he succeeded his father-in-law. Mr. Parker died only last year, and since his decease his Executors have taken it on a fresh lease of fourteen years at an increased rent. Five per cent. is paid for all improvements in buildings, &c., as agreed upon. The lease specifies that 30*l.* per annum shall be spent on artificial manures or bones, and the tenant is only to plough out of lea 12 acres each year, and only to have 36 acres under the plough, under a penalty of 20*l.* per acre. There are 82 acres of arable and 48 acres of meadow and pasture in the farm.

Character of Land.—The land is described by Mr. Parker (the son of the late tenant and manager of the farm for the Executors) as "light," with a gravel subsoil. It is, perhaps, not so stony as Mr. Handley's, but is still very full of rounded "drift." When rolled down in spring, after the sowing of the corn crops, it presents the appearance of a pavement, so thick do the stones lie. The soil is brown in colour, free of working, very little subject to "couch" or "twitch," but a good deal pestered with charlock.

Cropping.—Twelve acres of swedes are taken yearly, followed by barley. The land is laid down with the barley-crop, and kept in grass from 3 to 7 years, it is then broken up, and a crop of oats follows.

Swedes.—The turnip-land is ridged and manured with from 12 to 15 loads of dung, 10 cwt. of bone superphosphate, and 2 cwt. of guano per acre. The swedes are sown the first week in May. The sort preferred is called "Hallwood Bronze-top." It is really more of a green-topped variety. Very fine crops are raised. Last year the crop was estimated at 26 tons per acre, but Mr. Parker says 38 tons per acre have been grown upon the farm. They are all removed from the land. The bulbs we saw in February were very good, both in size and quality, and the growing crop in July was one of extraordinary promise. On this kind land they had all hit, and came away in one growth, and perhaps it will scarcely be believed that on July 6th some of them measured 3 feet across the top, the leaves being extended. The ridges are made 30 inches apart, and the roots are set out 14 inches in the rows. Mildew is scarcely known in this part of Westmoreland, and hence the extreme forwardness of the crop is viewed with favour. Fully two-thirds of the roots are consumed by cattle in the byres, and the remainder by sheep on the grass.

Barley.—The barley which follows is generally of good quality, and is sold for malting. Last year it made 40*s.* a quarter. Notwithstanding the entire removal of the roots, no artificial manure is required for the barley crop, or it gets too proud. If a part is seen to require it, some top-dressing is put on. This year it was clean and a fine crop.

Seeds.—The mixture of seeds used for laying down the land is 2½ lbs. cowgrass, 2 lbs. white clover, 1¼ lb. red clover, 1¼ lb. alsike, 1 lb. Timothy, 1 lb. trefoil, 1 lb. rib-grass, 1¼ lb. cocksfoot, 1¼ lb. Pacey's perennial ryegrass, and 1 peck of Italian ryegrass. This excellent mixture produces very fine plants of seeds, and almost without exception the layers on this farm, whether in their first, second, third, or fourth years, were first-class. A piece being grazed with sheep and calves in July, in its fourth year, was particularly noticeable as showing a perfect crop of clovers. The seeds are partly mown and partly grazed.

Potato-oats are grown usually. They generally weigh about 42 lbs. a bushel, and are all sold. Mr. Parker supplies two gentlemen's stables in the neighbourhood, and, as will be seen hereafter, replaces the oats by maize and other foods. The appearance of the oat-crop this year was not favourable. They were patchy, apparently having been eaten by wire-worm; neither were they by any means as clean as might be desired. Some contained a good deal of "field-kale" (charlock), and there were other weeds which might more easily have been removed.

In this "happy valley," and, indeed, in most other parts of Cumberland and Westmoreland, it is not considered necessary to weed the corn-crops, and a long immunity from such a practice has begotten an indifference to the sight of weeds, which is very trying to the eyes of a farmer from districts where such a custom is looked upon as one of the most essential operations of the farm. But, however little necessity there may be for it as a rule in this favoured region, a prize farm should at least be free from those devouring plants which not only offend the eye, but leave a legacy of trouble for succeeding years.

This remark is not intended to be more applicable to Mr. Parker's oat-crop than to many other farms which were entered in the Competition ; but although Moss End showed generally such excellent cultivation and stock that it deservedly took a very high place, *the whole* of the crops had to be considered, and the Judges were forced to note the unsatisfactory state of these oat-crops in making their decision.

One point more: it was a matter of remark by the Reporting Judge in making his round in the spring, that were such "hollowness" of soil permitted in many parts of England as is common here, the whole of the oat-crop would probably be lost by the ravages of grub and wireworm ; and we cannot help thinking that more pains in consolidating the land would be amply recompensed by increased crops. The pests which infest less favoured districts, whether insect or vegetable, seem little feared here, but a little more care perhaps might prevent many a catastrophe, even to a Westmoreland crop. *Verbum sat sapienti ;* and I am sure our friends of the North will not object to this little homily.

Meadow and Pastures.—About 20 acres of meadow land are mown annually. This land is regularly manured in winter with compost made of Preston night-soil and ashes (for the conveyance of which the canal through the farm offers great facilities), and farmyard-dung. The grass-land is generally of good quality, but will not stand much drought. Some of the hay is occasionally sold.

Herd.—Let us now turn to the live stock. A good Shorthorn herd is kept. No less than 10 of the cows are entered in the Herdbook, and the remainder have all three crosses of pure blood. The stock at our February visit consisted of—

22	Cows in-milk and in-calf,
10	Fat ditto,
10	Yearling heifers,
6	Two-year-old ditto (one in-calf),
23	Calves,
1	Bull.
72	

The cows are of grand frame and good condition and colour. The whole of the oat- and barley-straw is eaten by the cattle, and the milch-cows get swedes and some crushed maize and decorticated cotton-cake. The calves are weaned early, and get hay and oilcake-porridge. No litter is used in the byres, according to the practice of the country. The cows calve from January to April.

Some accidental circumstances had rather militated against the condition of a part of the herd in winter. The calves had all had "hoose," and though not one had been lost, they had suffered thereby in appearance. They were successfully treated with a mixture of turpentine and linseed-oil. A very fine cow which had bred a 33*l.* bull-calf had also slipped and lamed herself; but these little drawbacks had not altered the character of a very fine herd.

Very few of the he-calves are "steered," a ready sale being found for them at a twelvemonth old. Last winter twelve averaged 17*l.* 10*s.* each from this age to 15 months. The bull in use in the winter was "Bates' Duke" (36,223)—a home-bred bull by "Grand Duke of Beaumont" (31,283) we thought hardly worthy of his mates; and in April there was a youngster coming on named "2nd Master of Eskdale" (bred by Lord Bective by "Duke of Underley" from an American cow), who, however, in July had not made as much improvement as could be hoped for. The condition of the young stock in April was rather thin, and in July they struck us as not being equal to the older portion of the herd. The calves are turned out occasionally when the weather suits. In July the stock account was thus:—

20	Cows,
7	Two-year-old heifers,
10	Yearling ditto,
20	Calves,
1	Bull,
1	Steer.
59	

Sheep.—"Limestone" Breed.—Two separate flocks are kept, as on so many of these farms. Part are Lincoln and part "Limestone." The breed of Limestones has been kept upon the farm for many years. They are good-sized white sheep, with large curled horns, perfectly white faces, and a fine quality of wool, weighing about 7 lbs. a fleece. Ewes of this sort off this farm have weighed 30 lbs. a quarter, and rams have been made up to 40 lbs. a quarter. 500 or 600 prizes have been taken with them at various times by Mr. Parker's father, and he was the only exhibitor in the three Classes of this breed at Kilburn last summer. The females as well as the rams have horns, and the breed suits the dry limestone hills, Farleton and Whorlton Crags, which rise near here, where Scotch sheep cannot exist. For this purpose they are continued. Only about 18 or 20 ewes are kept here of this breed and 40 Lincolns. The total number of sheep on the farm in February was 105, which included 40 hoggets and 7 or 8 fat sheep; and in July there were 132, all told. Mr. Parker has a sheep-right on Farleton Crag, but as it is "unlimited" he does not exercise it.

Lincolns.—The Lincolns are of Clarke's and Dudding's breed. Tups are bred from them for local use. They begin to lamb about the end of February, and are useful sheep. During winter the ewes get swedes on grass, and no other keep. The appearance of both the "Crag" sheep—as the Limestones are locally called—and the Lincolns was unexceptionably healthy at both our visits. The gimmer "Crags" were especially good in appearance, and the lambs in July had that cleanliness which is so essential to health at that critical period.

Horses and Pigs.—The horses were not particularly noticeable. Only two workers are kept besides a pony, but there are generally some young ones running about. The workers are a lightish-legged sort, no doubt suitable for the land, but offering little for observation. Neither are the pigs an important feature. One breeding sow is kept, and one or two stores are fattened.

Buildings, &c.—The buildings are suitable for the farm. A good corn and hay shed, erected principally at the tenant's expense, cost 120*l.* The gates, which are found by the landlord, are of oak and very good. They are well painted and in excellent order. The fences are good for the country.

Labour.—The labour costs 80*l.* per annum. Two men are boarded in the house, and get 22*l.* per annum each. Two boys also kept get 6*l.* to 7*l.* The men and boys live the same as the family, and, adding 8*s.* a week each for their keep, the total cost of labour is about 160*l.*, equal to 2*l.* an acre on the arable land, or 30*s.* for that and 10*s.* for the pasture. As this seemed to be a farm where thorough good Westmoreland management prevailed, I give some particulars of the usual routine of farm-work. The men rise at 4.30 A.M. all the year round, and go out with the horses at 6.15, having done the live-stock previously. At 11.30 they come in to dinner, feed their horses, and at 1 o'clock are off again to work. At about 3.30 P.M. some hot tea and bread-and-butter is taken to them in the field, and at 7.30, the work of the day being finished, they get their supper.

Cakes and Artificial Manure.—The expenditure on cakes and artificials is kept at about 2*l.* an acre per annum.

Dairy.—Butter is made on a considerable scale, and goes to

Bradford. It has gone to the same place for 40 years. 100 lbs. a-week is averaged in the summer. A few milk-cheeses for home use are made, but not many. The dairy is a very good one, and there is no difficulty in keeping the milk three meals.

These are all the particulars it is necessary to give of a very interesting and typical Westmoreland farm. It is only needful to enter the household to know that its management is of a superior kind, and that it is characterised by that busy industry which is the rule of farm life in the county. Mr. Parker is ably seconded by his sister, who is thoroughly *au fait* with the details of the business, and, like other Westmoreland women, well bears her part in the general economy of farm practice.

Many prizes have been taken, not only by stock but also for the management of the farm, at various times. Fourteen Firsts have been awarded at Kendal, Lancaster, Kirkby Lonsdale, and Barton (local shows); but this is the first time it has been brought into such an extended competition, and the honour it has now gained is thoroughly merited.

MR. BENSON'S FARM, BOONWOOD, GOSFORTH, CUMBERLAND.

Very highly Commended.—Class II.

Situation.—I am now about to describe an excellent and extremely well-cultivated little farm, which ran its competitors so hard that it was commended to the notice of the Council for a third prize. "Boonwood," Mr. Benson's farm, is just on the skirts of the village of Gosforth, and in the immediate vicinity of the finest and wildest lake and mountain scenery in England. Wastwater lies at a distance of only four miles, and the "Screes" which dip into that lake are visible, together with Scawfell and all the mountain masses which lie at the head of the lake, from almost every portion of the farm. Towards the west lies a somewhat dreary tract of black sand between this and the sea, which at the aspiring bathing village of Seascale is only about three miles distant. The nearest market-town is Egremont, about five miles to the north, and Whitehaven is about ten miles off.

Soil and Subsoil.—The farm is only 100 acres in extent. It is held of the representatives of the late Mr. Henry Tyson of Gosforth, and there are 7 years yet unexpired of a 15 years' lease. It is strongish red land on the Sandstone formation, with good freestone beneath. Its elevation above the sea is inconsiderable (from 300 to 360 feet), but from its position, dominating as it does the flat country and lying near the base of the mountains, it commands very interesting prospects, on the one side of the coast for many miles, and on the other of very fine mountain groups.

Sixty acres are arable and 40 pasture. The size of the fields is convenient for so small a farm, running from 4 to 8 acres. It is nicely laid out, and convenient for good roads, the main turnpike from Whitehaven to the south intersecting one portion of it, and a by-road running off from this to the house and buildings.

Fences.—The fences are nearly all straight, and are of quickthorn, planted on banks. They are very nicely kept, and reflect great credit on the tenant.

Cropping—The usual system of cropping adopted is—

(1.) Swedes (8 acres), Potatoes (4 acres).
(2.) Wheat and oats.
(3.) Seeds mown.
(4.) Ditto grazed.
(5.) Oats.

Swedes.—The preparation of the land for swedes begins as early as practicable. Two ploughings are sufficient, and the land being little subject to couch, no picking by hand or otherwise is necessary. It is manured with 15 *loads of farmyard-dung*, and 11 cwt. *of mixed artificial manure per acre.* (About an acre of mangold is grown and treated precisely in a similar way.) The land is ridged, and the seed sown the first week in May. The artificials consist partly of dissolved bones, costing 8*l.* per ton; and partly of Peruvian guano, at 13*l.* 5*s.* The swedes this year were grand in appearance, a perfect plant, most healthy and luxuriant. Although not quite so forward as Mr. Parker's (in Westmoreland), they were as fine and promising as could be wished. Mr. Benson informed us that last year was the first of his tenancy on this farm, when the crop of turnips had been anything but first-rate. In that season they did not attain their usual size; but 29 tons 14 cwt. per acre was grown in 1878. The whole of the roots are removed from the land.

Potatoes.—The above crop was even excelled in appearance by the 4 acres of potatoes. Of these, 2½ acres consisted of Champions, and 1½ acre of Skerry-blues. Just half-a-ton an acre had sufficed to plant the Champions, which were the most magnificent crop we saw in our travels. These potatoes got 20 loads of dung, but not so much artificial as the swedes—about 5 cwt. per acre.

Corn Crops.—Wheat follows the swedes, and oats the potatoes. The kind of wheat sown is a red variety, and it is got in November. About 3 bushels per acre are sown. The crop this year was not heavy, but very clean and healthy.

Seeds.—The seeds which follow both these crops were this year very first-rate. There was a good deal of alsike clover in them, and nowhere did we see a finer or healthier swathe after the machine. In the second year they are grazed partly by cattle and partly by sheep; and oats completes the rotation. In cleanliness and good management this crop equals the rest.

The whole of the arable land deserves the greatest praise. The cleanliness is exceeding, and the work done in first-rate style, principally by Mr. Benson himself and his family. The greatest liberality is practised with manures where required; severe economy, as will be hereafter shown, with labour, except that of his own hands and those of his children.

Stock.—The stock, though not equal to some we found on the other farms, is all of a very useful and profitable character. In February it consisted of 38 head of cattle, 102 sheep, 3 horses, and 3 pigs; and in July there were 43 cattle, 74 sheep, 3 horses, and 7 pigs.

Cattle.—The cattle are nearly all Shorthorns, and of a very good sort. Twelve cows are kept, and their produce reared. The steers are kept till they are two years old, and the heifers are saved till they are three, when they are fattened, except the best, which are saved for the herd. A useful bull is in stock. The cows all show great milking capacity, and are of large frame and good quality. A good heifer or two are generally kept for Christmas. At Whitehaven last year a heifer of this age made 39*l.* 10*s.*, and took 8*l.* as a prize. She was taken by her purchaser into Yorkshire, and took another prize at Settle. All the cattle are in capital condition, and there is every token of good management in this department.

Sheep.—About 20 Leicester ewes are kept, and their produce sold as lambs. They are put to a Shropshire tup. Some other sheep, generally half-bred Leicesters and Herdwicks, are brought in and fattened on grass or turnips with cake, and 34 Herdwick gimmers were this year taken in from the fells to winter, at 7*s.* each, from October to April. These get no turnips on the grass. The lambs we saw in July were very good and healthy.

Horses.—The horses are fair. The threshing is done by fixed machinery, worked by three horses. In consequence, this is the usual number employed. Only two are required for chaff-cutting.

Pasture.—The pastures are very useful, and well managed. There is a good mowing meadow off-lying at a short distance. The thistles are kept down in the grazing-fields. *Both pastures and meadows, as well as all seed-lands, are top-dressed with* 2 cwt. *of bone-manure, or* 1½ cwt. *of Peruvian guano every year.*

Improvements.—When Mr. Benson entered on his lease he bought new gates for almost all the farm, and he provided a good many stone posts also. The gates are all well-kept and painted. He moreover put up at his own expense a large hay and corn-shed with four bays, which cost him 40*l.*

Artificial Foods and Manures.—The whole of the oat-crop is consumed on the farm, and some Indian corn and linseed-cake in addition, but we could not ascertain the quantity. The consumption of artificial manure, however, may be judged from my former statement as to the extreme liberality with which it is used.

Labour.—Only one young man, who gets 16*l.* a year besides his board, is regularly employed. (In summer an occasional man is required in addition.) The rest of the labour is entirely performed by Mr. Benson and his family. Two sons, of about 19 and 16 years of age respectively, live at home, and a daughter of 17 milks and does house work. Between them, therefore, this industrious family manage, at a very small outlay, to accomplish the labour of 100 acres of land, and moreover to do it extremely well. On few farms did we find greater general neatness and tidiness; on none greater cleanliness than on Boonwood.

Dairy.—The dairy should be mentioned in connection with the household labour. About 100*l.* a year is made of butter, which fetches a good price, and is sent weekly to Leeds.

Mr. Benson is one of those who has made his own way by integrity and industry. A farm servant for many years, he married his master's daughter, and by that prudence and good judgment which distinguish so many of the northern race, has succeeded in his worldly business, whilst he has most deservedly earned a very honourable place in this Competition. Few farms could show greater excellence in many important points; and though upon the whole his stock was not equal to that upon the first or second prize-farms, he took a high place in general management, and was well worthy the high commendation bestowed upon him by the Judges.

MR. KITCHEN'S FARM, THOMAS CLOSE, CUMBERLAND.

Commended.—Class II.

Situation.—It would be unfair, after the lengthened reports I have given of the other farms in this class, not to refer somewhat in detail to Mr. Kitchen's capitally managed farm, which was commended by the Judges. It is situated in the upland country, which extends to the west of the North-Western Railway between Penrith and Carlisle, and which seems to have been formerly a forest-region. It is not, generally speaking, an inviting district, but is apparently one capable of great improvement. It is about eight miles from the former town, and eleven from the latter, and some four miles west of the Calthwaite Station. The elevation of the farm is no less than 520 feet above sea-level.

General Characteristics.—Mr. Kitchen is another instance of industry rewarded, and his farm is in every respect a creditable one. It is held on a yearly tenancy from Mr. R. Barton, of Carlisle, but has been in Mr. Kitchen's possession for thirty years. Everything denotes a complete confidence between landlord and tenant. The buildings are good; far superior to the general run on such small farms in this county. The farm is exceedingly well-laid out, with good gates and straight and well-kept fences of quick-thorn. The rickyard is neatly kept, with a numbered stone against each stack, against which a reference is kept for condition. There is an open courtyard behind the house, which is rendered clean and agreeable by the absence of the usual dungheap. The farm is well done, the stock excellent, and the whole bears an aspect of neatness and prosperity which is very pleasing.

Soil.—The soil is a reddish loam with a subsoil of clay. It is rather strong, and requires the exercise of a good deal of judgment in working.

Size and Terms of Tenancy.—The farm is 140 acres in extent; viz. 126 acres arable, 10 meadow-land (mown), and 4 plantation and roads. By the terms of his agreement Mr. Kitchen can farm as he likes and sell what he likes, but he never avails himself of this privilege to sell hay, straw, *or any corn except wheat.*

Cropping.—The course of cropping is the usual one of the county, viz.:—

(1.) 20 to 26 acres swedes and turnips.
(2.) Wheat, barley, and oats.
(3.) Seeds, generally mown (but not all).
(4.) Ditto, grazed.
(5.) Oats.

Root Crops.—The land for swedes is excellently managed. They are sown on ridges 32 inches apart, and manured with 20 cartloads of dung per acre, and 6 cwt. of dissolved bones. For common turnips this heavy manuring cannot be afforded, and they get 9 or 10 cwt. per acre of artificial alone. Not more than one-third of the root-crop is carted, and the rest is consumed on the land; and in this matter we thought Mr. Kitchen did not show the judgment which characterised the rest of his farming. Certainly his oat-crops had suffered very much this season by the treading of the land in the consumption of the roots; and I find by my notes that the sowing of this crop was only finished on May 1st, after which a period of drought followed, and in consequence there was every prospect of a deficient crop. A small quantity of long red mangolds are taken, and, like all the rest in this county, they were affected with the grub in the leaf before alluded to. Potatoes were very good. This root-land was all exceedingly clean, and the roots which we saw in the winter were excellent in quality. Many of the purple-topped swedes had, however, perished with frost, but the green-tops of which the crop principally consisted were still very sound.

The roots, then, having been principally consumed upon the land, a small quantity of wheat (say 3 acres) follows on one portion; of barley (say 5 acres) upon another, and the remainder of the shift is sown with oats. Wheat is only grown for household consumption and for the sake of the straw for thatching, &c. The whole of the break is seeded down with 11 or 12 lbs. of clovers and 2 pecks of ryegrass, and oats complete the rotation. There are thus generally about 52 acres of land in corn, 26 in roots, and 52 in grass-seeds.

Live Stock.—Considering that there is no land in permanent grass, with the exception of the 10 acres of meadow always mown (which borders a little brook which runs through the farm), a large head of stock is maintained. In February there were 7 horses, 41 cattle, 165 sheep, and 10 pigs.

Cattle.—The cattle at this time were thus divided:—

12	Cows in-calf and in-milk.
4	Two-year-old heifers.
8	Yearlings (steers and heifers).
16	Calves.
1	Bull.
41	

The whole of these are rare good Shorthorn stock. A first-rate pedigree bull has always been used, and the one in service at present is a capital white beast, "Earl of Bland," entered in the Herdbook, and well worthy of note in this place. His stock also comes very good. The steers are kept till they are two years old, and they and the yearlings are summered in Greystoke Park, where cattle are taken in. About 30*s.* to 32*s.* 6*d.* is paid for the agistment of yearlings, and 42*s.* for two-year-olds.

Sheep.—A few ewes are kept, but breeding is not carried on to any extent. Half-bred Leicester and Cheviot ewes are crossed with a black-faced tup (either Shropshire or Oxford), but teg-sheep are principally brought in, in autumn and spring, to fatten on turnips or seeds, and the former are clipped and sold in spring. They get oats and hay with their swedes, but no cake. Mr. Kitchen had the first clipped tegs at Carlisle last year. Three-parts-bred (Leicester-Cheviots) are preferred for this purpose. They clip 6½ or 7 lbs. wool, and sell readily. Last winter they cost 21*s.* each, and went in April at an average of 45*s.* out of their wool. These were replaced by others, which in June cost 47*s.*, and would go fat in September with the aid of corn. The sheep-stock was generally good.

Horses.—Excellent horses are kept. There are five workers, with good bone and quality. Besides these, two colts wintered at home were sent for summering to Greystoke Park with the cattle. 65*s.* is paid for yearlings, and 85*s.* for two-year-olds. A five-year-old bay horse was sold at 56*l.* between our winter and summer visits.

Pigs.—Like the rest of the stock, the pigs are very good; a white sort with a touch of Berkshire.

Cakes and Artificials.—About 50*l.* a year is spent in cake and corn, besides the consumption of home-grown produce. Linseed and decorticated cotton are the cakes preferred, and maize is also used. Of artificial manure the consumption is liberal, about 11 tons being used, at a cost of 90*l.* and upwards. Bone-manure is relied upon.

Dairy.—A large dairy is kept. and sometimes 80 lbs. are churned and marketed at once. It is sold at Penrith, and this year prices have ranged from 1*s.* 1*d.* to 1*s.* 8*d.*

Labour.—Two horsemen live in the house, and an additional labourer is occasionally employed. The head ploughman gets 13*l.* 10*s.* the half-year, and the second man 10*l.* for the same time. Mr. Kitchen, jun., who is married, and lives adjoining the farm, does the cattle and sheep principally himself, his father being too far advanced in years for heavy labour. The extra man gets 12*s.* a week and all found, and is required for about three-quarters of the year. Work begins at 5 A.M. in summer, and 6 A.M. in winter. The horsemen clean out the byres, in addition to their proper work, and the day's labour is finished about 7.30 P.M. If extra hands are required in hay-time and harvest, 18*s.* or 20*s.* has to be given, in addition to their food. Beer is very little thought of or cared for, and one barrel in harvest represents the total consumption.

These are some of the principal features in the excellent management of this little farm. I do not think I should have done justice to it if I had not recorded these details; and if any reader of this 'Journal' should be tempted to inquire more particularly how both ends are made to meet, and something more besides, in these bad times, on land without any exceptional advantages of fertility or position, where almost no produce but the stock is sold, they might do worse than turn out of their way from Carlisle or Penrith and seek this information of Thomas Kitchen, of Thomas Close.

The other farms in Class II. present some points of interest, but I shall not dwell on them very long.

MR. SAVAGE'S FARM, HANGING BANK.

Mr. Savage's farm at Hanging Bank is in the vale of the Eden, not far from Appleby, and is chiefly noticeable for a very good flock of Lincoln sheep. It is 145 acres in extent, of which 91 acres are arable and 54 pasture. No conditions are signed, and he farms as he likes, but generally on the usual system of the country, except that barley and wheat always follow roots.

The land is a fertile loam of a reddish colour; not strong, but deep, with round stones. It is on the Permian system, which fills up the basin of the Eden.

Fine Grain.—Fine quality of grain of all sorts is grown, and last year a sample of Mr. Savage's potato-oats took first prize at the Birmingham Show, and wheat took second prize at the same exhibition. The oats weigh 46 lbs. a bushel in a good season. Most of the corn is sold for seed.

Lincoln Flock.—No flock worth talking about was kept on the farm previous to 1875. It rotted sheep up to that time; but drainage operations, carried on for the last twenty years, have altered this, and a small but good flock of Lincolns is now maintained in very healthy condition. This flock has been gradually increasing: in 1876 there were only 19 ewes and 23 lambs; in 1877, 40 ewes and 49 lambs; in 1878, 42 ewes and 53 lambs; and in 1879, 53 ewes and 69 lambs, and at this the flock at present stands. Tups are bred on a large scale, and find a market at Penrith and other places for crossing purposes; none are castrated. In 1879 they averaged 9*l.*, but last year only 6*l.* 6*s.* The blood is some of the best in Lincolnshire, and a fine old four-shear ram here, bred by Mr. Howard of Nocton Rise, cost 40*l.* A very good three-shear clipped 20½ lbs. of wool this spring. He is a fine sheep with a rare leg of mutton, but not so good on his shoulder top. A very good two-shear went to

Carlisle and took third prize in his class; and five good gimmers were also exhibited there. The ewes, like Mr. Jefferson's, are milked every three or four days for a fortnight, after the lambs are weaned. The stock of sheep in February consisted of 54 ewes, 3 old rams, 22 ram-hoggets and 36 gimmers, making a total of 115. In July there were 176, viz. 51 ewes, 69 lambs, 35 gimmers and 21 tups of all ages.

Cattle.—The cattle, though useful, are not so good as the sheep, and not particularly noticeable in this district; and the same may be said of the horses. The pigs are very good, of the short-nosed white breed.

Root Crops.—The mangolds were the best we saw in our travels, and last year beat swedes in weight per acre. This they do not often do. About 4*l.* 4*s.* an acre of artificial manure is spent on them, besides a heavy manuring. The swede land only gets one ploughing and several grubbings. Fifteen loads of manure per acre is applied in autumn, and 7 or 8 cwt. of Procter and Ryland's manure at the time of sowing. They are set out by women, with the hoe, at a cost of 8*s.* 6*d.* per acre. About half the crop is drawn off, and the remainder consumed on the land.

Successive Corn Cropping.—Mr. Savage on one close had taken oats after barley, with a result which did not promise much (in July) for the experiment, and we cannot doubt that in these countries, where corn growing is a secondary consideration, it is wise to adhere to the old rules, and not take two white-straw crops in succession. The cost of the manure used to get a decent crop seemed to us greater than the end gained.

The land is subject to field-kale, but not much to twitch. I should mention that all corn is *drilled*, a very unusual circumstance in the district. The farm-accounts are well kept, and we obtained every information we required as to labour and general statistics.

MR. WAGSTAFF'S FARM, PENRITH.

Mr. Wagstaff's farm is close to the town of Penrith, in a very advantageous position for rail and market. Moreover, it is extremely nice land. It is the property of Lord Lonsdale; and hay and straw are sold for the Lowther stables. It partakes more of the character of an accommodation farm than any of the rest, and the rent and out-goings altogether are very heavy. It was taken by Mr. Wagstaff when he held the Crown Hotel in Penrith, and continues in his occupation, although he now lives at Derby. Some nice sheep and cattle are kept, and the farm is in good condition, but there is nothing particular to dwell upon.

MR. ROTHERY'S FARM.

Mr. Rothery's small farm near Cockermouth is only noticeable as an example of what an industrious careful man can do, even with bad land. Mr. Rothery is a good instance of a self-made man, a real peasant-farmer of the best type. In service till long after middle age, he yet seized an opportunity which presented itself, and by his immense industry has succeeded in making his way, notwithstanding the disadvantage of cultivating very poor land in a bad climate. His management is deserving of great praise, and long may such examples be followed by others of his race.

MR SHEPHERD'S FARM.

Mr. Shepherd's farm does not call for any special notice. It is in a secluded country, some five or six miles west of Appleby.

It was a matter of regret to the Judges that the Pastoral Farms Classes attracted so little competition. The two farms reported below divided the honours, not a single entry having been made in the smaller farm class. In a district where tillage is of so little importance this must be considered a somewhat remarkable circumstance. Mr. Leathes' farm, as will be found from the report, partakes of the character of a tillage farm to a large extent. Mr. Mounsey's occupation is almost entirely a Herdwick sheep-run.

MR. LEATHES' FARM, LAMPLUGH HALL, CUMBERLAND.

First Prize Pastoral Farm.—Class III.

Situation.—Just on the western verge of the Lake district, where the mountains slope off into the undulating ground which stretches to the Solway and the Irish Sea, is situated Lamplugh Hall Farm, occupied by Mr. Leathes, to whom was awarded the first prize in the first class of Pastoral Farms.

To the north-east, separated only by a small intervening height, lies the Lake of Loweswater, and a short distance to the south is Ennerdale, with its lake and valley shut in by precipitous fells. To the west, stretching away towards St. Bees and Whitehaven, is the high moorland country whose mineral wealth is worked by the railway which traverses its slopes, and extends from Cleator (north of Egremont) to Marron, its junction with the Cockermouth and Workington line. To the north the eye ranges over a vast extent of country in the direction of Cockermouth and Maryport, and beyond the shining waters and sands of the Solway; in the distance is seen the mountain of Criffel, in Kirkudbrightshire, a few miles south of Dumfries, in Scotland, a prominent object from all this western district of Cumberland.

Lamplugh Cross, a hamlet in the parish, has a local reputation of being 8 miles from everywhere. In fact, it is nearly equidistant from Whitehaven, Egremont, and Cockermouth. The village is very small, as befits so remote a district, but the parish is considerable. Close by the little church are the scanty remains of the old manor house, called Lamplugh Hall, with an entrance by a gateway, bearing the date 1595. The modern farmhouse, which retains the name and site, is occupied by Mr. Leathes.

Characteristics of Farm and Elevation.—The farm is of a varied character, the cultivated part of it ranging in elevation from 450 to about 700 feet, and the mountain sheep-walk running to the top of Lamplugh Fell, reaching 1878 feet in height above the sea. The 600-feet altitude line of the Ordnance Map runs quite across the centre of the farm, by the church and village; so that this may be taken as the average elevation of this "Wet Vale," which is said to be the meaning of *Lamplugh*. On the mountain-side of the house rise boldly, and in beautiful swellings, the fells which form the sheep-pastures, and which are improved on their lower slopes, but gradually rise to the region of rock and storm and cloud. I will not allow myself to be led into description, but it is difficult to avoid saying a word of the splendid view which is to be had from even these lower slopes, the cultivated region at one's feet showing considerable signs of life and activity, with the railway creeping through its heart, and the smoke of mines or furnaces telling of human toil and prosperity. A deep cleft in the mountains opens just above the village, and on each side of this profound solitude rise in very steep slopes the Herdwick grazing-grounds. A prettier sight we have seldom seen than that which greeted us at our July visit, when the sheep having been collected on these slopes for our inspection, their cunning in eluding the collies which were engaged in the work of shepherding could be watched, and every movement of those sagacious animals could also be observed. The *cul de sac* in which this cleft terminates allowed a gazer on the lower ground a complete command of every manœuvre. The farm extends over about 1105 acres, of which 617 is fell-side sheep-run, 259 acres old pasture and meadow-land, and 230 arable "according to the lease;" i.e. any portion of this may be broken up and used for alternate husbandry.

Climate.—The climate is the great obstacle to the successful cultivation of the land. The soil is naturally of rather a strong character, a red loam upon the Sandstone formation, and, under other conditions, would no doubt be excellent turnip and corn land; but it is not easy to fight against the power of Nature, and Mr. Leathes is inclined to keep more land down permanently than he did, and wisely to let the climate work with him rather than against him. Only enough land, therefore, is broken up each year to provide a supply of turnips and straw for winter keep. The farm is held on lease for twenty-one years from 1872, with a Candlemas entry. Five per cent. is paid on a certain small outlay in drainage done by agreement. A "meal" mill is held, together with 16 acres of land, of another landlord, just on the outskirts of the farm, and is taken full advantage of by Mr. Leathes for the purpose of grinding his oats for the use of the farm.

Herdwick Sheep.—Mr. Leathes' speciality is his Herdwick flock. These hardy sheep find a congenial home on the fell, and know their way down to the lower grounds under stress of weather, or at lambing-time.

But the farm, as will have been gathered, is something more than a pastoral sheep-farm, and a considerable number of cattle are bred, reared, and fattened upon it. Work is found for four horses generally, and I will briefly note the husbandry of the arable land first, turning afterwards to the important feature of the sheep-management. The plough is only used here with the object of cleaning portions of the farm and laying them down to grass, and for straw to assist the wintering of the stock. Out of a total of 225 acres, considered as *arable* land under the lease (the inland being in all 488 acres), only one field is broken up yearly, and Mr. Leathes says he should abandon cultivation entirely if it were not for the excellent fit-up he has in his barn-machinery, and the expense he has been put to in regard to it.

Cropping.—The fields varying considerably in size, a definite area for green-crop and corn can scarcely be fixed, the practice being to break one field from grass every year; but generally from 12 to 18 acres of roots are sown. Of this about 1 or 1½ acre consists of potatoes, ½ acre to 1 acre mangolds, and the remainder swedes and common turnips. The usual course of this part of the country is adopted for the arable land. The land selected for cultivation is broken out of lea for oats. The field which most shows signs of failure in the grass is usually chosen. Turnips follow, and the roots are all carted off the land for consumption by sheep on grass, or by cattle in the yards. The oats are seeded down, and the seeds mown the first year and grazed the remainder of the shift, the land being again broken up when necessary.

The oat-stubble intended for the turnip-crop is broken up early in the winter. It gets three furrows and a good deal of grubbing before it can be got into condition for roots. This land by no means enjoys the immunity from "twitch" which I have noted in my description of some of the other farms, and both it and coltsfoot are troublesome weeds; the former especially is hard to deal with in such a climate. Very little artificial manure is used for the turnip-crop; but reliance is placed upon the dung made in the cattle-sheds for this purpose. Liming, however, is practised to a considerable extent. About 9 to 10 cartloads per acre (say 8 tons) are spread on the oat-stubble before it is ploughed up for the root-crop, and the action of frost is trusted to, to counteract the effect of so much carting and treading the land as is necessary for the moving this bulky material. This lime is made upon the farm, and costs 2*s.* per cartload, approximately, besides the labour of carting and spreading on the land.

Oats.—The oats grown are of fair quality generally, weighing about 42 lbs. per bushel. None are sold, but all are mealed at the mill and consumed upon the farm. The whole of the oat-straw is consumed by the cattle, being mostly cut into chaff by the water-power, which will be alluded to further on.

Besides the seeds which are mown, 42 acres of meadow are also cut for hay, and the land is dressed as often as possible with compost made with lime and the vegetable refuse of the farm, or with dung.

Cattle.—By this management Mr. Leathes is able to maintain a considerable head of cattle. At our February visit we found 95 head, in praise of the quality of which much could not be said, and in July 131 head, viz. 36 cows in-milk and in-calf, 75 above two years old, and 20 under that age. They are kept for pay, milking qualities being a recommendation, but a good many animals are also bought at the sales at Cockermouth, in store condition, and fattened off for the same market. The most taking of the cattle are some Galloways, towards which Mr. Leathes' proclivities seem tending. About 24 cows are kept, principally for milk, when a sufficient market can be found for that commodity. Butter is made of the remainder. The milk is sold at Frizington, a mining village near Lamplugh, 3*d.* per quart being charged for it. The cream is taken off the night milk, and the mixture of this skim with the morning's new milk is sold at this very remunerative price. Thus, besides the large sale of milk when times are prosperous with the miners, the sale of butter also reaches considerable proportions. In

1877 milk made 557*l.*, besides about 20*l.* sold at home, whilst butter in the same year made 142*l.*, upwards of 700*l.* being thus realised from dairy produce. In the farm year of 1875–6, 773*l.* was made of milk, butter, and eggs, including a small item of 12*l.* for sundries; but the Frizington trade has fallen off much of late from bad times, and as only as many cows are kept as will provide milk and butter for the demand, the receipts vary considerably from year to year, and have lately been reduced much below the above amount.

The great drawback to the winter keeping of cows is the deficiency of litter, which can seldom be afforded.

The cows and feeders are kept in roomy byres, and the younger stock in sheds and stables. The season of 1879 was unfavourable, and the oat-straw and hay were very bad in quality. This necessitated a much larger consumption than usual of artificial food; and cake, bran, and meal were never used so freely as during the last winter.

A five-horse power turbine-wheel, driven by a never-failing beck which runs near the premises, does the threshing, chaff-cutting and pulping of roots. A large pulper by Benthall, together with a chaff-cutter, is set to work each morning before breakfast, and a sufficiency of food mixed for the day's consumption. The landlord found the turbine-wheel and threshing machinery, the whole of the carting and excavating and the remainder of the apparatus were provided at Mr. Leathes' own expense.

Sheep.—The sheep stock must now be noticed. There were 1260 or thereabouts on the farm at our winter inspection, and nearly 1700 at our July visit. About 500 Herdwick ewes run on the fell in winter, besides a few "twinters." They come down to the lower grounds for lambing, which begins early in April, and should finish by the end of the same month. Only the cull ewes (about 114) are put to a Shropshire ram (or sometimes to a Longwool Leicester), the remainder of the flock is kept pure. They are a very good class of sheep, and some of them were shown at Kilburn in 1879, where they must have been delighted to find that they carried with them the weather to which they are accustomed on their own mountain. Much care is taken in the selection of the ewes, and those which do not show proper Herdwick character are soon rejected. It is not an easy matter to keep these individualities. The temptations are great to cross the breed with some of the more improved races, and thus to get earlier maturity and heavier carcasses; [illegible] the recognition of the fact that there are no sheep which [illegible] drought or wet, heat or cold, frost or snow, hurricane or [illegible] equal degree with these hardly little animals (at least on their native hills), inspires breeders with resolution and perseverance to continue the cultivation of the race in its integrity. In the manual called 'The New Shepherd's Guide,' which contains the marks of the whole of the sheep in the Lake country, I find a curious essay by Mr. William Abbot, of Coniston, to which allusion has been previously made, which contains some remarks bearing on this point. Mr. Abbot says: "To make judicious and good crosses, and keep a stock going without any mistakes is more than the best of our Herdwick men can do. When fresh blood is once infused into the stock there is no retraction. None can foretell the results; they may be right, but the worst part is they are sometimes wrong; so that Herdwick breeders should look to themselves and be very careful in the selection of their male animals. Neither can they bestow too much attention on their breeding ewes." Mr. Leathes seems fully alive to these difficulties. He has strong ideas on the qualifications of a Herdwick sheep, and acts up to them, both in his selection of fresh blood and in the drafts which are made from time to time from the flock of ewes.

The wether hoggs are usually got away to the butcher in July or August. Should any of them not be fit by this time, they are put upon turnips and other trough food and kept until Christmas. The "gimmers" are drawn from amongst them about the middle of May (which is as soon as the mountain ewes get away to their heath again after lambing) and grazed in the "intacks" (i.e. large enclosures) above the house until the autumn; they are then put to the ram or sold for that purpose. The markets of course influence Mr. Leathes in these matters, but he prefers selling all the "mule" lambs, as the crosses are styled, at weaning-time in the latter end of September, when the price is satisfactory. They have averaged as much as 21*s.* 3*d.* each, but last year the "tops" scarcely fetched 15*s.* each, and the "shots" had to be kept and wintered. These we saw in February.

In July the sheep stock stood thus:—

712	Herdwicks washed from mountain (ewes and lambs).
252	"Mule" lambs.
168	Herdwick ditto.
98	Down lambs for fat lamb.
308	Hoggets.
120	Ewes, barren and with lambs.
7	Rams.
17	Shearling gimmers for show, &c.
5	Ewes with rams.
5	Lambs ditto.
1692	

The return made by Mr. Leathes to the Board of Trade in June gave 1184 sheep above a year old, and 529 lambs; total, 1713.

The lower parts of the fells are mountain pasture of a very useful quality—a short, soft, sweet turf, not unlike the southern "downs." The more elevated portions are of course principally heather (which forms the principal food of the sheep in winter), mixed with rock, in the crevices of which there is some sweet picking of grass. Mr. Leathes says no summer drought or rain hurts him, but want of sunshine is injurious. In spring, however, the sheep often suffer from dry and cold weather. No hay is given them in winter, even in snow. The hardihood of the race may be inferred from this statement, and it seems that, given a certain range, the flock have to fight their own battles and get their own living as best they can.

At the April visit of the Reporting Judge lambing was far advanced: losses had been small and the lambs were very healthy. No better testimony than this could be offered as to the strength of the stock.

It is worthy of remark that Mr. Leathes had not lost any ewes from the complaint alluded to in the report of Mr. Mounsey's farm, and this he attributes to the use of lime upon the land, and he gave me some instances which seemed to confirm this assertion. Scab causes considerable loss sometimes, but great care is exercised, and the sheep are dipped frequently. The hoggs get three dippings in the year, viz. in March, August, and October or November; and the whole of the mountain stock get dipped in August for the fly, and in November for the protection of the wool. Mr. Leathes says that dipping is a very important operation with a hill flock, and great care is exercised as to the temperature of the bath, the period of immersion, and the thorough mixture of proper ingredients.* But dipping is not always practised without fatal results, and there were several such cases this spring. The dipping is managed in a business-like way, a complete apparatus and structure having been erected for the purpose.

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* Mr. Leathes says, "At the latter period of dipping, viz. in October and November, the dip is kept at such a heat (about new-milk warm, though I do not test it with a thermometer), that we can mix in it about 4 lbs. of Skinners' grease (which costs about 4*d*. a lb.) for every ten sheep. This is done by warming the grease over the fire in a large pan, keeping it in a liquid state, and adding to it as it is being put into the dip a small portion of soda, just sufficient to make the grease and dipping mix well together. Enough for ten sheep is put into the dipping-tub at one time, as they are being passed through it. The greatest art is to have sufficient boiling water to keep the dip up to a proper heat, otherwise the operation is very unsatisfactory. The grease is used instead of 'salving' the sheep, a slow process by which only about one sheep can be done in an hour. With a staff of eight men and boys we can dip, according to the way described, upwards of 600 in eight hours."

The draft ewes are not invariably put to Shropshire tups. In February we saw some nice "mules" (half-bred Leicester and Herdwick). These would be easily disposed of during the spring and summer, and when they get turnips there is no difficulty in sending them away fat. When they are crossed with Shropshire they run on the low land, and the lambs are made off fat. These half-bred lambs come very black and spotted, whilst the pure Herdwicks are beautifully white, with black legs and faces, white ears very erect, and sometimes spots on the body like a leopard, which afterwards die out. Nothing can be more attractive than the appearance of these lambs. Their beauty is equalled only by their liveliness, and this is much more noticeable than in the cultivated breeds. Seen playing on the slopes of the hills or on the verdant knolls of this beautiful country on a fine spring day, they give an animation to the scene which is very striking. The ewes are fattened off, after their lambs are gone, on the low land during the winter. Some sheep of various breeds (Cheviot wethers, &c.) are bought in also, as the keeping allows, and fattened off on the grass with turnips.

Cakes and Artificial Foods.—About 400*l.* a-year is spent in cakes and artificial foods, but this includes the oatmeal for the house. The cakes are all broken at the mill before alluded to, and weighed off there, and this forms a reliable check upon their consumption.

Hedges and Fences.—If any proof were wanted of the natural fertility of the valley-land at Lamplugh, it would be afforded by the hedges. These are all on banks, according to the custom of the country, but the vigour of their growth is surprising. They are being much improved, but they had fallen into a bad state when Mr. Leathes entered on the farm. They are entirely of whitethorn, and, well grown, afford a great natural protection to the stock in inclement weather. Above the house the fences are chiefly dry stone walls; but the 617 acres of common (hill-side) were enclosed twelve years ago with wood posts and ordinary fencing wire. When enclosing such land, the material ought to be posts of iron and the best galvanized wire, the posts having a thoroughly good coat of paint at the finish. The result of using inferior material in such an exposed situation is that at present some of the above fences want removing.

Labour.—From 5 to 7 men are employed, besides 2 girls, who milk and do housework, &c. There are 2 horsemen, 1 milkman and 1 cowboy, 1 shepherd, 2 spadesmen, hedgers, &c., and Mr. Leathes has one apprentice, who takes his regular share of the farm work.

The milkman gets 12*s.* a-week, besides his board in the house and a small commission on sales of milk. The shepherd has a cottage close to, but he boards in, the house.

The actual expenditure (on labour) for the last two years has been as follows:—

Candlemas 1878 *to* 1879—				£	s.	d.
Paid as per Labour Book				229	13	0*
Board of six men, estimated at 8s. per man per week, for 52 weeks				124	16	0
	£	s.	d.			
Milkman† 40 weeks, at 21s.	42	0	0			
„ 12 weeks, at 12s.	7	4	0			
„ 12 weeks' board, at 8s.	4	16	0			
				54	0	0
3 cottages occupied by labourers, rent- and rate-free				19	10	0
				427	19	0

Candlemas 1879 *to* 1880—				£	s.	d.
Paid labourers as per book				185	9	6
Board as per last year's account				124	16	0
Milkman (who sells milk)—	£	s.	d.			
„ 52 weeks, at 12s.	31	4	0			
„ 52 weeks' board, at 8s.	20	16	0			
				52	0	0
3 cottages as per last year's account				19	10	0
				381	15	6

I must conclude my account of this farm by saying that much pains are taken with the poultry. The ducks, geese, turkeys, and chickens are all excellent and well managed. Houdans and Bramahs are the breeds most encouraged, and these fowls are kept distinct by the use of little wooden boxes, which are carried about the farm.

MR. MOUNSEY'S FARM, HIGH LORTON, CUMBERLAND.

Second Prize Pastoral Farm.—Class III.

The Vale of Lorton is well known to Lake tourists. It forms one of the not least attractive parts of a beautiful excursion from Keswick or Cockermouth, and visitors who stay awhile in the Buttermere and Crummock district often feel drawn from the severe mountain scenery round those lakes to the smiling valley through which the river Cocker empties their waters. As one descends the road from Scale Hill, having left behind the wild Honister Crag and neighbouring hills, a delightful view opens out. A luxuriant vale, which seems even softer by contrast with the country left behind, unfolds itself. The view is not only one of uncommon beauty, but of great extent, embracing the Solway and Scotch mountains beyond. The traveller feels inclined to linger in such a scene. There is no approach to this valley which does not exhibit it in an attractive light. Whether gradually nearing the mountains from Cockermouth, or descending upon the valley from their flanks, it is equally fascinating.

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* In this account the two maid-servants' wages (15*l.* and 11*l.*) are included, but as in summer they always assist to milk and take charge of the calves from the pail, their board is not included, but is charged to house expenses.

† 21*s.* a-week up to Martinmas 1878, and 12*s.* a-week, with board.

In the most beautiful part, where lawns and meadows and trees, set off by human habitations, form a picture which seems to laugh at the stern hills which hedge in the vale, lies the little village of Lorton, and here is Mr. Mounsey's farmhouse. The pretty pastures of the residence called Lorton Park, which form part of the farm, are a pleasant feature in the occupation. Their extent, however, is small. About 37 acres lie directly in front of the mansion in question, and 10 acres more of the same description of land lie just beyond the rustic little church, at a short distance farther down the valley. This might have been the scene of many of Wordsworth's descriptive pieces, so free is it kept

> "From all intrusion of the restless world,
> By rocks impassable and mountains huge."

But what connects it specially with his verse is the

> "Yew-tree, pride of Lorton vale,"

which is close to Mr. Mounsey's pastures. The conceit which made this ancient tree

> "Not loth to furnish weapons for the bands
> Of Umfraville or Percy, ere they marched
> To Scotland's heaths; or those that crossed the sea
> And drew their sounding bows at Agincourt,
> Perhaps at earlier Crecy or Poictiers"

has drawn many tourists to its shade, and associated it indelibly with the poet; but recent storms have sadly lopped its glories.

The land here is perfectly flat, and, besides its beauties and its associations to recommend it, has the further virtue of being good in quality, though, from its gravelly nature, incapable of bearing much drought, which, from the proximity of the mountains, it is not often visited by.

There are two or three other enclosures of scattered land not far off, which are occupied as accommodation closes for shelter, &c., and a rather larger lot of about six acres is passed in ascending the Keswick road to the main portion of the occupation, the mountain sheep-run, where Mr. Mounsey keeps his Herdwick flock. A mile or two of steep ascent from the village brings us to this land and to the farmhouse of Darling How, which belongs to it. A path here follows a small stream into the heart of a mountain solitude so profoundly quiet that a hermit might choose it for his abode. The mountain slopes descend immediately to the banks of the brawling beck, and on them Mr. Mounsey's flock find their pasturage. The mountain descends on the south side to the Keswick road, and the extremely steep and rough sides of Whinlatter, which bounds the turnpike-road for some distance, are part of the sheep-run, which is divided into two principal enclosures of 247 and 213 acres respectively. This part is little more than a slope of slaty débris, so steep that it looks as if it might overwhelm the road; but in these rocks and crevices the best sheep often seek their pasturage.

The glen where the farmhouse is situated is cut off from all other communication with the world than by the lane which leads to it; and on the lower slopes are some improved enclosures varying from 15 to 30 acres, the mountain-run reaching an elevation of 1700 feet.

The total area of the farm is 750 acres, of which 50 acres are valley land, and the remainder hill of a very varying description. There is no arable land. It is held on a yearly tenure, and has been in Mr. Mounsey's occupation only four years.

A few cows are kept at the buildings at home, and some calves reared, and some Irish stock is also grazed; but there is nothing particularly worthy of notice, and the sole interest of the farm, beyond the beauty of the valley, is in the Herdwick flock.

About 600 ewes are kept. The exact number put to the tup last winter was 604, and besides these Mr. Mounsey had 30 young sheep and 10 "bred" ewes. The system here is different from Mr. Leathes'. Mr. Mounsey maintains his flock by buying drafts from other breeders. Mr. Leathes breeds his own. Mr. Mounsey, of course, under this system, only obtains "shots," and his flock suffers in character accordingly.

The ewes run on the mountain summer and winter, and lamb there also. They get a bit of hay in very bad winters, but it is not often that they require any help. The usual crop of lambs does not exceed 450, and this year it did not even come up to that number by 30 or more. There were very few twins, and when an ewe lost her lamb, she had to go for "geld" (barren), which is terribly against profit. "Geld" ewes are not liked for breeding purposes after. They seldom do well the next year.

The ewes lamb in April. The age to which the Herdwick ewe will continue to breed and make a good mother is astonishing, considering the hardness of her fare and the climate of the hill. "Nine months winter, and three months cold weather," is Mr. Mounsey's description of the climate; and he says he often keeps ewes till they are ten or twelve years old. If the drafts he gets yearly to add to his flock are good, three crops of lambs can be taken from them, and sometimes more, as the ewes improve for the first two years. The prices vary very much. Last year ewes cost from 13*s.* 6*d.* to 22*s.*, but they are generally higher than that.

The lambs are dipped at the washing-time of the ewes, that is about June 24th, or as near as the weather will permit; and both ewes and lambs are dipped again about August 10th. Cooper's dip and soft-soap are used for these summer dips, and they save the sheep from maggots, which they are very liable to in August and September. About the 25th of October they are again dipped, and this time with brown grease melted and Cooper's dip. This operation costs about 2¼*d.* a sheep. The bath should be 80°, or the grease does not penetrate to the skin, and the sheep look badly the whole winter after, if the grease is sticking on the wool.

At my April visit Mr. Mounsey had been unfortunate enough to lose some nine or ten ewes with a complaint to which these fells are subject. It had been described to him as "enteric fever." The sheep are seized with a trembling fit, jump in the air, and are soon dead. In Scotland it is called the "louping ill," and it is probably caused by some deficiency in the soil or herbage.* Otherwise the health of the flock during the winter had been remarkably good, and in February Mr. Mounsey informed us that he had only lost two sheep on the fell in the entire winter.

About seven score ewes are drafted from the flock every year. They are treated in the same way as Mr. Leathes'. Put to a big Lincoln tup, they are sold soon after lambing, together with their produce, or before lambing if possible.

The whole of the shepherding on this farm is done by Mr. Mounsey and his son, a boy of about 15 or 16. At lambing-time another and younger lad also helps, and the boys spend their days on the mountain, and their nights at the farmhouse up there. A knowledge of the whole flock is thus early inculcated, and all ordinary cases of parturition are successfully undertaken by these youngsters. To find a boy of 14 the accoucheur of a mountain flock was to me a surprise. But it only indicates the early age at which the Cumberland farmer considers it necessary that the training of his children for pastoral pursuits should begin.

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* I noticed in my report of his farm, p. 574, that Mr. Leathes attributed it to want of lime.

Altogether, in the light of a mere Herdwick sheep-run, this farm is an interesting one. A day spent among his flock with Mr. Mounsey would assuredly elicit a large amount of valuable information. An acquaintance with the dialect of the country would be advisable, for many of Mr. Mounsey's most racy stories are given, as they should be, in their native dress. He moreover possesses a fund of information on subjects connected with his calling which make him an interesting companion; and a fine summer day on the mountain-side in his company might perhaps reconcile even a 'Field' reporter to a more charitable view of Herdwick peculiarities.

CONCLUSION.

I should like to add to this already lengthy Report a few words in conclusion. One cannot return from the survey of these Northern farms without considering in what manner the peculiarities of their agriculture have averted from them the misfortunes which have fallen on the more Southern districts of Great Britain; and the question will many a time be asked of the visitor to Cumberland and Westmoreland, "How do you account for this continued prosperity, when the rest of the agricultural community is being crushed?"

I have in former parts of this Report alluded to one or two of the causes which have undoubtedly operated on behalf of the Northern farmer, and especially I have marked the pastoral character of the occupations. But there are one or two further causes, which seem to me important, and to which I should like to call further attention; and I will divide my observations into those matters which are owing (1) to Nature (soil, climate, &c.), and (2) to custom and habit.

(1.) To Nature—i.e. to the climate and soil—the Cumberland or Westmoreland farmer is undoubtedly much indebted. The root crop is one of the special excellences of his agriculture. Even in the worst of years swedes seldom fail to produce a large crop of splendid quality when their cultivation is well managed. Their fattening qualities are undeniable, and in bulk it may be doubted whether any other parts of Great Britain can excel the crops in some of these favoured districts.

Again, the enormous advantage of being able to keep seeds down from 4 to 7 years or even more—as some of the candidates in this competition are accustomed to do—cannot be overlooked; and this is due in a great measure to the climate.

Furthermore, under this head, the quality of the oat crop,—straw and grain,—must not be omitted from consideration. The excellence of both is remarkable, and as both are consumed by the farm stock, much advantage accrues from this superiority. Any Southern farmer who has seen the eager way in which Cumberland cows devour the oat-straw which is their principal provender, must be surprised at the difference of its quality from that of his own country.

And lastly, in this question of soil and climate must be considered an almost entire immunity from the most troublesome of all weeds, viz., common twitch or couch, which is to me one of the most remarkable features of Northern agriculture. A light upstanding crop of oats is harvested after perhaps from 4 to 10 years' lea. The result of such a course of cropping in the Eastern counties would be fatal. A perfect mat-bed of twitch would usurp the land, and offer such an obstacle to its subsequent cultivation as would not easily be surmounted. But in these counties no such inconvenience is sustained. When the oat-stubble is ploughed for roots, two or three cultivations are sufficient to bring it into condition, and none of the tedious and costly processes which are necessary on a Southern farm are here required. Those endless harrowings and rollings, hand-pickings and burnings, can be entirely dispensed with.

Finding no twitch on a Cumberland farm, I asked the occupier what were the weeds to which he was most subject. As he hesitated in answering, I observed, "I see no twitch." "No," said he, "I have none of that stuff." "Neither have I seen any thistles," said I. "No," he remarked, "I have none." "What about field kale (charlock)?" I inquired. "No," he answered; "though there is a great deal in the county, I have none on this farm?" "Then, in the name of goodness, what are your weed pests?" I inquired. To which his reply was, "I have no weeds of any consequence on this farm!"

To take another instance. In the last week in April, when the turnip-land was being got ready for sowing, on two farms of considerable size I found an old man and a woman respectively engaged in "sprittling" out with a fork the few pieces of grassy twitch sod which alone it was thought necessary to disengage from the soil before the final ploughing; but even in these instances it was not considered requisite to pick up and destroy these morsels, which on an Eastern farm would be looked upon with as much suspicion as a firebrand in the rick-yard. All this must be due to some peculiarity of soil and climate which I do not pretend to understand.

Talking, over a pipe, one evening to an intelligent gentleman whom I accidentally met, and who I believe farmed in the vicinity of Morecambe Bay, he asserted that much of the land in these counties was *naturally* free from twitch, and that its introduction was only attributable generally to the use of foreign grasses. For his part, he never used anything but the grass seeds grown on his own farm, suffering a piece of grass each year to get into the ripening stage before cutting, and saving the seeds; and he never suffered from twitch.

These, then, are some of the natural causes at work in favour of the Northern farmer: and now let us look at the artificial ones.

(2) First among these in rank comes the question of labour—in which, I conceive, he possesses other decided advantages. For generations has the Cumberland and Westmoreland labourer been as superior in *morale* to his fellows of the South as he has in *physique*. He is therefore accustomed to the every-day performance of tasks from which the latter would revolt, even were he as equal to them as the other. Add to this, the constant supervision from dwelling in the same house as his employer, and the superiority of fare from living at the same table, and we have some explanation of his greater capability. His greater *willingness* probably springs from an ambition to rise, which is easier of fulfilment with him than with the Southern labourer. Where master and man are so much more nearly equal socially, there is more chance for a superior servant to push his way. Two, if not more, of the candidates in Class II. in this competition were the architects of their own position, and had raised themselves from this very class of which I speak.

Lastly, I shall briefly mention one other circumstance, which, although a minor one, is not without its influence in giving an advantage to Northern agriculture. The smallness of the burdens on land in the North was a matter of frequent remark by the Judges when making the necessary inquiries about the outgoings of the farm. Tithe seems almost unknown, or, if paid, is generally a most insignificant item. Poor-rates, also, are often barely half what they are in the South; whilst the road-rates, from the abundance of local material, form scarcely ever more than a nominal charge.

These remarks may be taken for what they are worth. Certain it is that whilst in the South ruin has been gradually creeping upon the farming interest, in Cumberland and Westmoreland small traces can be found of any such calamity; and although I do not here pretend to probe the question to the root, I could not conclude this Report without some attempt, however feeble, to point out and classify some of the causes which have led to this significant and painful contrast.

XXVIII.—*On a New Method of Testing Milk.* By Dr. AUGUSTUS VOELCKER, F.R.S.

THE milk of healthy cows, it is well known, varies in composition and quality to some extent, according to a number of conditions, such as the age and breed of the cows, the time of the year when they are milked, distance from the time of calving, the liberal or scanty supply of food, and its quality and suitability for producing either rich or watery milk, and other circumstances to which it is not necessary to refer in particular in this place.

Whilst, however, under ordinary conditions of proper feeding, the proportions of curd, milk-sugar, mineral matters, and water do not vary to any large extent in cows' milk, the percentage of butter-fat, its most valuable constituent, is subject to considerable fluctuations, which proportionately affect the quality and economic value of milk.

The estimation of pure butter-fat in milk by a ready method, requiring on the part of the operator no special training in chemical manipulation, has long been felt a great desideratum; for there can be no doubt that such a method would be a boon to milk-contractors, to the makers of butter, and to all persons to whom it is matter of importance to be able to ascertain without delay whether milk is rich or poor in butter-fat. Butter-fat, it need hardly be mentioned, occurs in milk in the form of cream-globules, which rise to the surface as cream on allowing milk to stand at rest for a period of from six to twelve hours.

Instruments for measuring the percentage of cream in milk are called "creamometers." They are made either in the form of a cylindrical measuring-glass, on a glass foot, and divided into 100 equal measures, or in the form of graduated wide glass tubes. The gradations proceed downwards, from a point near the open end, marked zero, and each division indicates 1 per cent. of cream. Such creamometers have long been used, and are still employed, for testing the quality of milk. I showed, as far back as 1863, that the indications given by creamometers are unreliable in forming a correct estimate of the richness of milk in butter-fat.

There are two circumstances which seriously interfere with the practical use of the creamometer. The first is, that the cream which rises from different kinds of milk often varies greatly in composition. Cream may contain not more than 18 per cent. of pure butter, or it may contain from 24 per cent. to 28 per cent. The cream of small breeds of cattle is generally richer than that of large breeds; and milk, although it throws up comparatively little cream, may nevertheless be rich in butter-fat.

The second disturbing circumstance in the use of this instrument lies in the fact that milk which has suffered agitation by travelling long distances by railway, or which has been much shaken in passing from the hands of the wholesale dealer to the retail dealer and distributer of milk, throws up less cream than that which has not been much disturbed. In fact, the more or less violent agitation of milk has the effect of breaking up some of the cream-globules, in consequence of which the cream thrown up by such milk, although apparently thin, nevertheless is richer in fatty matter than the cream of milk which has not been subject to agitation or suffered a partial churning process.

More reliable indications of the richness of milk in butter-fat than the ordinary creamometer, which shows the percentage of cream by measure, are obtained by instruments constructed on the optical methods of examination.

Donné's Lactoscope is an instrument constructed on the optical principle of testing milk, but, for some reason or other, it has not been received with general approbation.

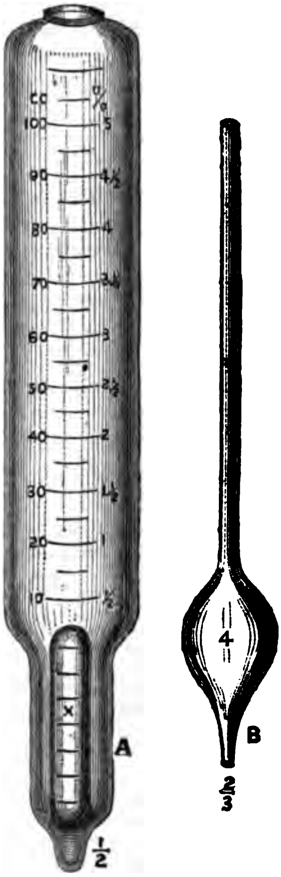
A far more simple lactoscope, based on the same principle as Donné's, has recently been invented by Professor Feser, of Munich, under whose directions it is now made by Mr. Johannes Greiner, philosophical instrument maker, Munich. Every instrument sent out from Mr. Greiner's workshop is verified and certified by Professor Feser to have been properly graduated. In England, Feser's lactoscope can be obtained at a moderate cost from Messrs. Aug. Bell and Co., of 34, Maiden Lane, Southampton Street, W.C., who also supply a complete set of apparatus for testing milk, including besides Feser's lactoscope, a delicate thermometer, and a lacto-densometer for taking the specific gravity of milk, which latter instrument also affords very useful indications of the quality of milk.

Milk rich in cream, as is well known, is more opaque than that from which more or less cream has been removed by skimming, or to which water has been added. Professor Feser's lactoscope is based on the principle of measuring the comparative opacity of milk, and thereby determining its richness in cream-globules or fat.

The following woodcut represents Feser's lactoscope—half its natural size. It consists, it will be seen, simply of a graduated wide glass tube, closed at the attenuated end, and having at the other end an aperture which can be closed by placing the thumb upon it. In the attenuated part of the tube a smaller cylindrical closed tube is fused in, made of white or (so-called) milk-glass;

is inner small tube are marked black lines, which become ble when milk is poured into the instrument, and only a water is added to it, but which are clearly seen when more is gradually added to the milk. The richer the milk is in -globules, or, in other words, tter-fat, the more water must led to it before the black lines e inner tube of Feser's lacto- become visible in the watered surrounding the inner tube; on the other hand, if the milk or in cream or watered, less is needed to show the black on the inner cylindrical tube.

Feser's Lactoscope (one-half the natural size).



that is required in testing by this instrument is to deliver ans of a pipette, B, a measured ity of milk (4 cubic centi-s), or, in other words, to suck the pipette milk up to the in the narrow tube end of the e, and to let it flow into Feser's cope, and to blow out the last from the pipette. Common -water is then gradually added e milk, the contents of the cope are shaken up, to secure t mixture, and the addition of is stopped as soon as the lines on the inner cylindrical become plainly visible. The s on the right side of Feser's cope then show at once the tage of pure butter-fat in the whilst the numbers on the nd side merely show the ity of water, in cubic centi-s, that has been added to bring e black lines: these numbers as well be omitted, as they ead only to confusion, and are not wanted. The whole ion of testing milk by this method occupies only a few es' time, and nothing can be more simple and easy in ce.

is instrument, I am informed, is employed extensively in any, Holland, and Denmark, by dairymen, milk con-rs, and officers appointed by the authorities to test t purity of articles of food and drink, and it is reputed to give fairly accurate particulars of the quality of milk. I was anxious to make some experiments with a view of ascertaining how far Feser's lactoscope can be depended upon to indicate with precision the percentage of pure butter-fat in milk.

Having procured the instrument direct from Munich, I tested with it a number of samples of milk, the exact composition of which I subsequently ascertained by careful chemical analyses.

On the 23rd of July, 1879, four samples of milk were bought in milk-shops:—

No. 1 was milk bought in Holborn.
No. 2 " " Eagle Street, Holborn.
No. 3 " " another shop in Holborn.
No. 4 " " New Bond Street.

On analysis these milks showed the following composition:—

COMPOSITION of FOUR SAMPLES of MILK.

	No. 1.	No. 2.	No. 3.	No. 4.
Water	88·71	88·11	88·96	87·20
Pure butter-fat	3·17	4·10	3·43	3·20
*Solids not fat	8·02	7·79	7·61	9·60
	100·00	100·00	100·00	100·00
*Including ash	·61	·59	·58	..
Specific gravity of milk at 18° C. ..	1·0285	1·029	1·028	1·031
Percentage of cream by measure thrown up on standing for 18 hours	per cent. 9	per cent. 13	per cent. 8	per cent. 12

By measuring the cream which came to the top in the graduated narrow measuring glass cylinders or creamometers, two of the samples of milk—namely, No. 1 and No. 4—containing almost exactly the same amount of pure butter-fat, 9 per cent. of cream were obtained from one sample and 12 per cent. from the other; whilst the sample No. 3, containing rather more fat than No. 4, threw up only 8 per cent. of cream, showing plainly that the indications of the creamometer, as regards the richness of milk in fat, are altogether fallacious.

Tested in Feser's lactoscope, the four samples showed the following percentages of pure butter-fat:—

Milk.	Percentage of pure Butter-fat.
No. 1	2¾ to 3 per cent.
No. 2	3 to 3¼ "
No. 3	2¾ to 3 "
No. 4	3½ to 3¾ "

these trials Feser's instrument showed the percentage of ittle under the mark in the case of samples No. 1 and , and slightly too high in sample No. 4; whilst in the Jo. 2 the indications were decidedly below the real amount

r removal of the cream, the skim-milk produced from these s was analysed, and the following results were obtained:—

COMPOSITION of SKIM-MILK.

	No. 1.	No. 2.	No. 3.	No. 4.
.. ..	91·33	90·87	90·82	89·03
fat	·45	1·01	1·58	1·84
not fat	8·22	8·12	7·60	9·13
	100·00	100·00	100·00	100·00
cific gravity at 18° C.	1·032	1·0305	1·0285	1·034
ser's lactoscope showed :—	per cent.	per cent.	per cent.	per cent.
centage of pure butter-fat ..	¾ to 1	2 to 2¼	1¾	2 to 2¼

he case of skim-milk it appears that Feser's indications oo high. The skim-milk from milk No. 2 was rather acid than the three remaining samples; this probably its for Feser's lactoscope showing a larger percentage of n the skim-milk really contained. When skim-milk turns y acid on keeping, without coagulation, I find that it es more opaque than it is in a fresher condition, and for eason the lactoscope in this case gives the percentage of high.

he next place I purposely watered some of the milk No. 4, ling to 100 measures 10 measures of water in one trial, another, and 30 in the third.

standing for eighteen hours the three samples of watered hrew up the following percentages of cream :—

	Milk No. 4 watered with		
	10 Per Cent. added Water.	20 Per Cent. added Water.	30 Per Cent. added Water.
age of cream	11	10¾	9
's lactoscope showed in these watered lks :—	per cent.	per cent.	per cent.
age of pure butter-fat	3½	3¼	2¾

The skim-milk from the sample No. 4 was likewise watered by the addition of 10, 20, and 30 measures of water to 100 measures of skim-milk.

Thus watered the three samples of skim-milk had the following specific gravity:—

	Skim-Milk from Sample No. 4 with		
	10 Per Cent. added Water.	20 Per Cent. added Water.	30 Per Cent. added Water.
Specific gravity at 19° C.	1·0315	1·029	1·027
Feser's lactoscope showed:— Pure butter-fat	per cent. 1¾	per cent. 1½	per cent. 1

Although Feser's lactoscope in these experiments does not appear to have given very accurate results, it will be seen that the instrument shows most distinctly whether new or skim-milk has been watered.

On the 31st of July, 1879, I received a sample of milk from Sir Henry Dashwood, Kirtlington Park, Oxon, and analysed it on the same day on which I received it, and at the same time tried some experiments with Feser's lactoscope.

The composition of this milk was as follows:—

Water	86·85
Pure butter-fat	3·80
*Caseine (curd)	3· 0
Milk-sugar	5·56
Mineral matter (ash)	0·73
	100·00
*Containing nitrogen	0· 49
Specific gravity at 20·6° C.	1·032
Percentage of cream by volume after standing 24 hours	5· 0

The preceding analysis represents fairly the average composition of good genuine country milk. The milk was sent to me by rail in a small tin only half filled, and evidently had been shaken about a good deal before reaching me, which accounts for its throwing up only 5 per cent. of cream, although it contained nearly 4 per cent. of butter-fat.

In this milk Feser's lactoscope showed 3½ to 3¾ per cent. of pure butter-fat, which agrees closely with the actual proportions of fat as determined by chemical analysis.

After the addition of 10, 20, and 30 measures of water to

100 measures of the same milk, the following results were obtained:—

	Milk with		
	10 Per Cent. added Water.	20 Per Cent. added Water.	30 Per Cent. added Water.
Feser's lactoscope indicated:—	per cent.	per cent.	per cent.
Pure butter-fat	3	2½	2¼
Specific gravity at 21° C.	1·030	1·027	1·025

In this case, again, the indications by Feser's lactoscope were satisfactory.

It will further be seen that the admixture of water to milk in any considerable degree is at once detected by the lowering of its specific gravity, which in genuine good milk seldom falls below 1·029 or 1·028.

The skim-milk from the July sample of milk on analysis gave the following results:—

Composition of Skim-Milk.

Water	87·50
Butter-fat	2·86
*Solids not fat	9·64
	100·00
*Including ash	0·72
Specific gravity at 20° C.	1·034

Feser's lactoscope indicated 2½ per cent. of butter-fat, a result which agrees very well with the real amount of fat in this sample.

Diluted with 10, 20, and 30 per cent. of added water, the same skim-milk, when tested by Feser's lactoscope, gave the following results:—

	Skim-Milk diluted with		
	10 Per Cent. of added Water.	20 Per Cent. of added Water.	30 Per Cent. of added Water.
	per cent.	per cent.	per cent.
Percentage of butter-fat	2 to 2¼	1¾	1½
Specific gravity at 21° C.	1·032	1·029	1·027

In these experiments the results obtained both by Feser's lactoscope and the hydrometer, showing the specific gravity, are satisfactory and useful in clearly showing in a most expeditious and simple manner whether new or skim-milk has been watered.

Two other samples of milk, one bought in August in milk-shops in Tichborne Court and the other in Clapham Common, on analysis gave the following results:—

COMPOSITION of TWO SAMPLES of MILK.

	No. 1. Clapham Common.	**No. 2.** Tichborne Court.
Water	87·05	90·17
Fat	4·01	3·16
*Caseine	3·19	2·31
Milk-sugar	5·01	3·67
Mineral matter (ash)	·74	·69
	100·00	100·00
*Containing nitrogen	·516	·377
Specific gravity at 23° C.	1·032	1·024
Percentage of cream on standing for 24 hours	11	7
Feser's lactoscope indicated:— Percentage of butter-fat	per cent. 3¼	per cent. 2¾

In the case of the sample No. 1, Feser's indications were somewhat low, and nearer the mark in the case of the milk bought in Tichborne Court, which, it will be seen from the preceding analysis, was watered. Both Feser's lactoscope and the specific gravity test also showed this quite plainly.

Mixed with 10, 20, and 30 per cent. of added water, the milk bought at Clapham Common showed when tested with Feser's lactoscope—

	The Milk bought at Clapham Common mixed with		
	10 Per Cent. of added Water.	20 Per Cent. of added Water.	30 Per Cent. of added Water.
Percentage of butter-fat	per cent. 2¾ to 3	per cent. 2½	per cent. 2¼
The specific gravity of these milks at 23° C. was	1·030	1·027	1·0245
Percentage of cream by measure	10	9	9

The milk bought in Tichborne Court, watered and tested he same way as the Clapham Common sample, gave the owing results :—

	Milk bought in Tichborne Court watered with		
	10 Per Cent. of added Water.	20 Per Cent. of added Water.	30 Per Cent. of added Water.
eser's lactoscope showed :—	per cent.	per cent.	per cent.
ter-fat	2¼	2	1¾
cific gravity at 23° C.	1·023	1·021	1·019
centage of cream after standing for 24 ours	6½	6	5¾

The SKIM-MILK from the preceding SAMPLES had the following COMPOSITION.

	No. 1. Clapham Common.	No. 2. Tichborne Court.
Water	88·63	91·33
Butter-fat	1·67	1·18
*Solids not fat	9·70	7·49
	100·00	100·00
* Including ash	·77	·60
Feser's lactoscope showed :—	per cent.	per cent.
Percentage of butter-fat	1¾	1½

n the skim-milks watered respectively with 10, 20, and 30 cent. of added water Feser's lactoscope indicated—

	Skim-Milk from Clapham Common, watered with		
	10 Per Cent. of added Water.	20 Per Cent. of added Water.	30 Per Cent. of added Water.
centage of fat	1⅝	1¼	1⅛
	And the watered Skim-Milk bought in Titchborne Court.		
centage of fat	1⅜	1¼	1

n October I bought a sample of milk in Bond Street, and lysed it before and after skimming.

The following was the composition of the milk before and after skimming:—

	New Milk.	Skim Milk.
Water	87·67	89·81
Butter-fat	3·27	1·02
*Solids not fat	9·06	10·17
	100·00	100·00
	per cent.	per cent.
*Including ash	·72	·72
		at 15° C.
Specific gravity at 19° C.	1·032	1·035
Percentage of cream on standing for 12 hours	9	..
Feser's lactoscope indicated:—		
Percentage of fat..	2¾ to 3	..

Reviewing the preceding experiments, it will appear that although Feser's lactoscope does not give in all cases quite accurately the amount of butter-fat in milk, and shows certain descrepancies when milk is not quite fresh, it is nevertheless a very useful instrument for practical use. In most cases it shows without much trouble in a few minutes an approach to the real proportion of butter-fat in milk sufficiently near to enable an observer at once to form a pretty good estimate of the comparative richness of different samples of milk, and, in conjunction with the specific gravity test, to ascertain with certainty whether milk is genuine new milk or watered milk, and whether milk has been partially or wholly skimmed, and at the same time whether it has been adulterated with little or much water. I can therefore recommend it to all persons interested in dairy matters.

XXIX.—*On the Composition of Ewes' Milk.* By Dr. AUGUSTUS VOELCKER, F.R.S.

THERE are not many analyses of ewes' and goats' milk on record, and having recently examined several samples of ewes' and goats' milk, I place the results on record, together with some others of ewes' milk which I obtained in former years.

Ewes' milk, it will be seen, is more concentrated than cows' milk, and differs considerably in composition, more especially

COMPOSITION of NINE SAMPLES of EWES' MILK.

	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.	No. 6.	No. 7.	No. 8.	No. 9. Colostrum.
Water	83·70	75·00	86·70	86·12	84·15	79·02	84·24	84·73	69·74
Fat	4·45	12·78	3·67	2·16	2·32	10·24	4·78	3·65	2·75
*Caseine	5·16	6·58	4·44	5·59	5·91	4·56	4·31	5·37	17·37
Milk-sugar..	5·73	4·66	4·00	4·93	6·57	5·19	5·80	5·46	8·85
Mineral matter (ash) ..	·96	·98	1·19	1·20	1·05	·99	·87	·79	1·29
	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00
*Containing nitrogen..	·83	1·05	·71	·89	·94	·73	·69	·86	2·78
Specific gravity ..	..	..	..	..	1·042	1·031	1·036	1·041	1·063

as regards the percentage of fat. Thus in the case of these nine samples one sample contained as little as 2 per cent. of fat, in round numbers, and another as much as 12¾ per cent. Generally speaking, ewes' milk, on an average, is richer in fat than cows' milk.

The sample marked No. 9 can hardly be called milk. It was quite yellow and thick, and was, in fact, not perfect milk, but the liquid called "colostrum," which first passes from the ewe before the regular flow of milk sets in. It will be noticed that ewes' colostrum is extremely rich in caseine and comparatively poor in fat.

XXX.—*On the Composition of Goats' Milk.* By Dr. AUGUSTUS VOELCKER, F.R.S.

GOATS' milk, it appears from the subjoined analyses, is very rich in fat and more concentrated than ewes' milk.

The samples submitted to analysis were taken in the morning from goats exhibited at the Dairy Show held in October, 1879, at Islington.

No. 1 was milk from a short-haired goat with horns, white and tan, about 3 years old, in-milk; last kid June 15th; the property of Mr. E. T. Crookenden, 305, Deptford Lower Road.

No. 2 was milk from a long-haired Pyrenean goat, with horns, 5 years 7 months old; last kid in April, 1879; belonging to the breeder, Mr. Martin Cazenave, Arboit, Canton Daucan, Hautes Pyrénées.

No. 3 was milk from a goat without horns; 5 years old; in-milk; last kid July 2nd, 1879; belonging to Mr. Stephen Dickens, 5 Hornsey Street, Holloway Road, N.

COMPOSITION of THREE SAMPLES of GOATS' MILK.

	No. 1.	No. 2.	No. 3.
	per cent.	per cent.	per cent.
Water	82·02	84·48	83·51
Fat	7·02	6·11	7·34
*Casein	4·67	3·94	3·19
Milk-sugar	5·28	4·68	5·19
Mineral matter (ash)	1·01	·79	·77
	100·00	100·00	100·00
*Containing nitrogen	·78	·63	·51
Specific gravity at 60° Fahr. ..	1·0357	1·0302	1·0302

The cream-globules in goats' milk are, I find, smaller than in cows' milk; and as the milk is more concentrated than cows' milk, the cream-globules are contained in goats' milk in a more perfect state of emulsion than in cows' milk, in consequence of which hardly any cream rises to the surface on allowing goats' milk to stand at rest for twelve hours or longer. One of the samples threw up scarcely 1 per cent. of cream, and the two others none at all, after standing for twenty-four hours.

XXXI.—*Report of the Senior Steward of Live-Stock at Carlisle, 1880.* By Lieut.-Col. PICTON TURBERVILL, of Ewenny Priory, Bridgend.

THE Council of the Royal Agricultural Society intrusts the management of the Stock exhibited in their Showyard to four Stewards appointed from their body, one of whom retires annually, and is replaced by another member.

During the first year of office, the Steward has charge of the Pig classes; in the second, of the Sheep; in the third, of the Cattle; and in the fourth and last, he superintends the Horse classes, is Senior Steward, and then retires.

It is a custom of the Society, that at the conclusion of each Annual Show the Senior Steward for the year should draw up a short Report on it; and accordingly it now becomes my duty to submit the following remarks on the Show of 1880, recently held at Carlisle, premising that, as the Society appoints a thoroughly able agriculturist (Mr. Finlay Dun has this year accepted the office) to prepare a full and exhaustive Report for the Journal, it is merely necessary that any statement submitted by the Senior Steward should be prefatory to this, and not enter into matters of detail connected with the Show.

For the purpose of selecting a place for holding their annual exhibition, the Society divides England into seven districts, known as A, B, C, D, E, F, and G, and the Show is held in each in the order in which they stand. The Exhibition of 1879 having taken place at Kilburn, in division "A," that of 1880 fell to division "B," which comprises the counties of Northumberland, Durham, Cumberland, and Westmoreland.

The necessary funds having been subscribed, and the City of Carlisle having, through its Mayor and representatives, offered a site in every respect most suitable for a showyard, it was resolved by the Council that the Annual Exhibition of 1880 should be held there on the 12th, 13th, 14th, 15th, and 16th of July, under the Presidency of his Grace the Duke of Bedford.

The ground obtained by the exertions of the Mayor of Carlisle and Local Committee proved most compact and convenient, and was in every way admirable for the purpose required.

It was situated almost in the city, and close under the walls of Carlisle Castle, on level land near the river Eden and intersected by the river Calder, which divided it into two nearly equal parts. The entrance was at the S.E. end, close to the Castle, and the central avenue ran nearly S.E. and N.W.

The portion of the land nearest the entrance, about 35 acres in extent, reaching as far as the river Calder, is called the "Sauceries," and is the property of the Corporation of Carlisle. This was devoted to the Implement and Machinery department.

The north-western portion of the site was a piece of land called the "Withy Holme," belonging to the Duke of Devonshire, and lying on the far side of the river Calder. Of this, between 30 and 35 acres were enclosed, and connected with the Implement-yard by two substantial wooden bridges across the Calder, erected specially by the Local Committee. This enclosure formed the yard for the exhibition of Stock.

A siding constructed by the Caledonian Railway Company, close to the middle of the south-western side of the Yard, afforded every facility for the unloading and loading of both stock and machinery, and all the arrangements for effecting this were most efficiently carried out by the Caledonian and the other railways working in connection with it.

On Saturday, the 10th of July, the Implement-yard was opened to the public, the charge being half-a-crown. Though the day was very fine the attendance was but small, as is usually the case when only a portion of the Show is open.

On Sunday the 11th, a special service for the men in the yard was held in the forenoon in the large tent, and was extremely well attended. A most appropriate and eloquent sermon was preached by the Lord Bishop of Carlisle, and listened to with great interest by the congregation. In the afternoon the veteran Dean of Carlisle delivered an able discourse at the Cathedral, on the duties of man to the lower orders of animals, a subject which might be, I think, with advantage, more frequently dwelt upon in the pulpit than it is.

The old "border City" was gaily decorated for the occasion. A sum of 200*l.*, voted by the Town Council, had been made good use of, and the inhabitants vied with one another in adding to the bright appearance of the streets leading in the direction of the Showyard. When, on the market-day, the open space before the Court-house was dotted all over with stalls for the sale of fruit, vegetables, and other articles, and the buildings all round it decorated with coloured flags, banners, and devices, the city had more the appearance of a foreign than of an English town.

On the morning of the 12th July—the opening day—the weather having been fine and dry, and everything connected with the Yard in capital order, a successful week was anticipated; but, unfortunately, a change took place. Slight rain fell for a short time in the afternoon, and was followed between three and four in the afternoon by a very heavy storm, which, for a time, stopped the judging, and completely saturated the ground.

On the 13th, 14th, and 15th, it was raining, on and off, for most part of the time, and the ground was in such a bad state, that the parades of stock advertised to take place at fixed hours could not be carried out with any regularity.

About 3 A.M. on the morning of the 14th, a report was spread that the rivers were rising rapidly, and fears were entertained that the Showyard might be flooded; but, fortunately, no further rise took place, and the water subsided to some extent.

I am indebted to Mr. George Wood, the Secretary of the Local Committee, for the following statement of the rainfall at Carlisle, taken at the cemetery during the time of the Show:—

Saturday,	July 10	No rain.
Sunday,	„ 11	No rain.
Monday,	„ 12	·42 in.
Tuesday,	„ 13	1·00 in.
Wednesday	„ 14	·87 in.
Thursday,	„ 15	·49 in.
Friday,	„ 16	No rain.

—showing the rainfall during the first four days of the Show to have been 2·78 inches.

Considering the unfavourable state of the weather during the first four days, and the condition to which the Yard had been brought by the continuous rain, the attendance of the public was far in excesss of what might have been reasonably expected.

On Thursday, though a wet morning succeeded a wet night, and the rain continued during a considerable part of the day, the admissions at the gates were 42,682. The manner in which the people streamed into the Yard, and, when there, ignored the rain and slush, and appeared thoroughly to enjoy themselves under most trying conditions, was a source of astonishment to all those who, coming from less humid districts, were not so well seasoned to rain as the inhabitants of the North-western district appear — fortunately for themselves and the Society—to be.

It may, I think, be safely assumed, that no such attendance could have been obtained under similar circumstances in most parts of the Kingdom.

The last time the Royal Agricultural Society visited Carlisle was in the year 1855, when the number of classes of stock for which prizes were offered was 76, against 182 this year; the number of exhibits in stock 808, against 1501 now; and the money value of the prizes offered for stock 1550*l.*, whilst this year it amounts to 5716*l.*

The number of exhibitors of implements was 118 in 1855, against 269 in 1880; and the latter number would have been largely exceeded, had not the Council found it necessary to restrict the entries, by making a largely increased charge for space, not permitting duplicates to be shown, and also excluding many articles which had, in their opinion, no connection with agriculture. For these reasons the number of entries, as well as the space occupied by machinery and agricultural implements, was reduced far below that of recent years.

The Police arrangements within the Yard were carried out by a detachment of the A Division of the Metropolitan Police, and were most complete and efficient. It is satisfactory to be able to state that no accident of any sort occurred in the Yard to mar the pleasure of the Meeting, nor was there any disease or sickness among the stock.

The Dairy-shed, where different processes for the separation of cream from milk and the manufacture of butter were carried out under the direction of Mr. Allender, of the Aylesbury Dairy Company, was repeated, as at Kilburn, but with the addition of a covered stand by the side of the dairy, for the convenience of spectators. It was well filled by the public, who paid a small admission fee, and the amount received was sufficient to cover the cost of its erection.

The semaphores for signalling between the large ring in front of the Grand Stand and the collecting-ring were tried, and found to be most useful in saving a great deal of running about and calling out to those employed in mustering and parading the Horse and Cattle classes. They were first erected last year at Kilburn, but had not a fair trial, on account of the state of the ground having stopped the parades.

The Beekeepers' Association had a tent in the Yard, where the driving and manipulation of bees were daily exhibited.

Pisciculture was also represented by Mr. Armistead, of Roundhay, Leeds, who had a shed containing, in small tanks, specimens of char, American trout, and other fish, as well as a set of breeding-troughs for hatching the ova.

The number of Horses entered for the Show was 487, being in excess of the entries of any previous year, except 1879. By a new rule, all horses entered in classes where there are restrictions as to height were measured on entering the Yard. The quality varied much in different classes, some being moderate, and others exceedingly good.

With reference to Class 14, for Pony Stallions, the Judges expressed their surprise to find, after giving the awards, that the first, second, and third prize horses, as well as the reserve number, all belonged to the same owner, Mr. Christopher Wilson. They also attributed the fact that only two entries were made in Classes 46 and 48 to the knowledge, on the part of proposing exhibitors, that the two well-known prize-takers, "Lady Walton" and "Charles 3rd," also belonging to Mr. Christopher Wilson, would compete in those classes.

The entries in the Cattle Classes were 434. The Shorthorns were considered by the Judges much above the average; and, in the aggregate, probably no better were ever exhibited at any Show. The entries of Herefords, Devons, Sussex, and other breeds special to distant districts, were not large in number, but the quality generally was very good.

With reference to the Channel Island Classes, the Judges were agreeably surprised to find such a numerous collection so far north, the whole entries being 56, of which 11 were from the North of England, whilst in 1855 there were no entries.

The Ayrshires are noticed as being very good. All the prizes were carried off by the Duke of Buccleuch.

The Judges are profuse in their praise and admiration of the "Polled Galloway," and "Polled Angus or Aberdeen," both for number and quality; and they further remark that the former were brought out in excellent form, and showed no indication of being unduly pampered, but were in a suitable condition for breeding-cattle. Of the latter class, they say that agriculturists have never seen such a collection before.

With the classes of Dairy Cows the Judges express their disappointment at finding so few entries in the centre of a very large and important dairy district.

Sheep were represented by 434 entries. The Judges considered the Shropshire, Hampshire, Mountain, and Herdwick breeds very good; the Leicester, Cotswold, and Border Leicester good; whilst they describe the Lonk as excellent, and regret that more were not exhibited.

There were 146 entries of Pigs. The classes for White Pigs are stated to be most excellent, and as good as ever appeared in a Royal Agricultural Showyard. In one class the Judges recommended a third prize for special merit. At this Show not a single pig was disqualified by the Veterinary Inspectors as being above the age represented on the certificate of entry.

A field-trial of Agricultural Machinery and Implements was made at Harraby, about a mile and a half out of Carlisle.

The following is a Statement of the

RECEIPTS in the SHOW-YARD, and NUMBERS ADMITTED.

Date—1880.	Charge.		Number Admitted.	Receipts.		
	s.	*d.*		£	*s.*	*d.*
July 10, Saturday ..	2	6	270	33	15	0
„ 12, Monday	5	0	2,455	613	17	6
„ 13, Tuesday	2	6	9,459	1182	19	5
„ 14, Wednesday ..	2	6	13,164	1645	16	9
„ 15, Thursday ..	1	0	42,682	2140	3	8
„ 16, Friday	1	0	23,981	1200	8	10
Totals			92,011	6817	1	2
By Season and Day Tickets			.. ..	656	11	0
„ Sales of Catalogues			.. ..	625	5	6
„ Grand Stand and Dairy Stand			.. ..	495	16	6
Gross .. .. £				8594	14	2

The expenses of the Society have not yet been completely made up, but it is estimated that there will be a deficiency of from 1500*l.* to 1600*l.* when the accounts are balanced. With the unfavourable condition as regards weather under which the Show of 1880 was held, it was impossible that it should have been remunerative to the Society.

Such a condition of things as was experienced at Kilburn and Carlisle, not only most materially diminishes receipts, but also entails a very heavy outlay in materials and haulage to make the Yard passable to the public, and in the extra straw required for the comfort and health of the stock—and thus entrenches on the funds of the Society in two directions.

Taking all things into consideration, the result of Carlisle seems to indicate that a Show held in an agricultural district of the country need not necessarily end in a loss.

Had the Stock Prize List not exceeded the average of the sums offered in the years 1876, 1877, and 1879, viz., 3480*l.*, upwards of 1000*l.* would have been saved to the Society, and the consequent loss reduced to a few hundreds, even under the unfavourable circumstances which existed; whilst, with ordinarily fine weather, the receipts would have been so much greater as to have placed a considerable balance to the credit of the Society at the end of the Show, instead of a deficit.

In submitting my Report as retiring Steward, I feel glad to avail myself of the opportunity it affords me of expressing my sincere thanks to my brother Stewards, and to all with whom my duties have associated me, for the courtesy and aid I have uniformly met with at their hands, which has made the period of my office a pleasurable one to look back upon.

The last Senior Steward concluded his Report by wishing that the sun might shine brightly on the next Annual Meeting. This it has failed to do; but we must all hope that it will make amends for its absence from Kilburn and Carlisle by showing itself with increased brilliancy at Derby, in 1881, under his Presidency.

Ewenny Priory, Bridgend.

XXXII.—*Report on Live-Stock at Carlisle.* By FINLAY DUN, 2 Portland Place, London.

SINCE the Royal visited Carlisle in 1855 many and great changes have taken place in agriculture. Steam has been applied to the cultivation of the soil, reaping and mowing machines have been widely introduced, great improvements have been made in all the mechanical appliances of the farm, general and technical education has extended amongst the agricultural classes. The live-stock of the farm has been considerably improved; useful economical animals have been more widely distributed; the opportunities and facilities for obtaining superior sires have been multiplied and extended.

Mist and rain make Cattle-breeding the prominent feature of Cumberland and Westmoreland farming. Long anterior to 1855 the observant North-countrymen appreciated the good qualities of the improved Durhams, and bought, hired, or clubbed together to procure goodly well-shaped bulls. Persistent continuance in this wise course has left its mark upon the cattle of the district—size, substance, and quality being seldom so largely found elsewhere. This early supremacy has been maintained and extended by the spirited introduction of numerous superior herds of Shorthorns. Besides others of good local repute, too numerous to mention, are Lord Bective's "Duchesses," "Airdrie Duchesses," "Princesses," "Red Roses" and "Wild Eyes;" Sir Wilfrid Lawson's "Wild Eyes" and his grand old "Bensons," topped by "Baron Oxford 6th," and other first-class sires; Mr. S. P. Foster's superior "Oxfords," "Wild Eyes" and "Duchess Nancys;" the Rev. T. Staniforth's excellent Booths, chiefly bred from Mr. T. E. Pawlett's "Rose of Hope" of the Mantalini tribe; and Mr. J. Hetherington's "Gwynnes." Close at hand, in the corner of North Lancashire, are the Duke of

Devonshire's unrivalled "Oxfords" and "Winsomes," Lord Lathom's "Duchesses," descended from his New York Mills 6000-guineas "1st Duchess of Oneida," his "Cherry Duchesses," "Winsomes," "Waterloos," and "Gwynnes," and the Messrs. Ashburner's admirable herds. From most of these valuable stocks well-selected impressive good blood is widely distributed through the recently established annual bull sales. Emulation accelerates the progress of improvement. The North-Western Counties contribute to the Shorthorn Society about a hundred members, most of them busily engaged in stock-breeding. That such numerous handy sources of superior bovine character are fairly taken advantage of is evident in every local showyard and fair, in every pasture and yard, and very notably in the large number of local exhibitors, who, handling well such good materials, succeeded at the Carlisle Show in wresting from a host of more distant comers one-half of the prizes for male Shorthorns.

Amongst Sheep, steady improvement has likewise taken place. As with the cattle, earlier maturity is aimed at, cheap concentrated food is more freely used, several months' keep is saved. Leicesters and Border Leicesters on the lower ground, and improved Cheviots on the hills, have displaced the commoner nondescripts, and driven the rough, goat-like, slow-maturing Herdwicks far up amongst the fells.

Fewer hunters and carriage-horses are bred than formerly. Amongst young cattle and sheep their rearing is not very profitable. Increasing attention is, however, bestowed on superior hacks and cobs, and cart-horses are bred on many farms. They are generally of Clydesdale character, short-legged and active, as is desirable in a hilly country. There has been praiseworthy anxiety to secure good feet and sound flat legs, less encumbered than formerly with rough coarse hair. From the Glasgow Spring Shows good horses have from time to time been brought south, and "Prince Henry," the second-prize Clydesdale in the Yard, has spent this season in the Carlisle district.

Since the Royal Meeting of 1855 steady improvement has occurred, not only in the useful characters of the live-stock, but also in their value. Shorthorns especially have mounted to high figures. In 1852 Mr. George Drewry bought for the Duke of Devonshire "Oxford 15th" at 250 guineas. Several of her descendants have since been sold for upwards of 2000 guineas. Sir Wilfrid Lawson recently gave 1200 guineas for "Baron Oxford 6th;" Mr. S. P. Foster wrote a cheque for 2500 guineas for "Duke of Ormskirk," and paid 850 guineas for the year's hire of "Duke of Hillhurst." Want of money amongst the classes connected with agriculture has recently reduced the value of all excepting a few of the most aristocratic Shorthorns. It has not, however, affected the value of ordinary cattle, which have advanced fully 30 per cent. on the prices of a quarter of a century ago. Beef of medium quality in the Metropolitan Market, then worth about 4*s.* per 8 lbs., now makes 5*s.* 6*d.*; mutton, then selling at 4*s.* 8*d.*, now realises 6*s.* 6*d.* Cattle, 18 to 20 months old, with good points, natural flesh and kindly grown, without stint, bring 15*l.* to 18*l.* Really good feeding sheep are increasingly difficult to buy; those who breed them endeavour to keep and feed as many as possible, securing both breeder's and feeder's profit. Lambs at the autumn fairs twenty-five years ago were wont to bring less than 20*s.*, now they as readily average 30*s.* Similar appreciation has occurred in hunters, carriage-horses, and cobs. Powerful active heavy draught animals adapted for town work, then procurable for 40*l.* or 50*l.*, now reach 80*l.* to 100*l.*, whilst double that price is often given for good brood-mares. The demand exceeds the supply, and dealers declare that even at these enhanced prices really first-class horses are difficult to find.

The development of agriculture during five-and-twenty years is well illustrated by the growth of the Royal Showyards. The former Carlisle Exhibition was declared to be "the most successful, excepting Windsor, that the Society has ever held, not only as regards the superiority of the animals exhibited, but also as regards the financial department." It occupied, however, 15 acres, or about one-fourth the area of the present Show. The prizes for live-stock, then amounting to 1550*l.*, have steadily grown to 5716*l.*, and have increased fully 1000*l.* within five years. The animals entered in 1855 numbered 808; in 1880 the entries reached 1501. Horses and Shorthorns, the striking features of the former meeting, were prominent attractions of the latter one. Not only have the numbers increased; new varieties, adapted for particular purposes and localities, have been cultivated, and were well represented. The old Longhorns have made a vigorous effort to regain the position they held a hundred years ago as good dairy and general-purpose cattle. Jerseys, Sussex, and Norfolk Polled, in their showyard form, may be said to be comparatively recent creations. Distinctive breeds of sheep, particularly Border Leicesters, Oxfords, Shropshires, and Hampshire Downs, have been brought to rare perfection. Improvements have taken place amongst pigs, notably in Berkshires. In 1855 complaints were made of misstatements as to age, and of over-feeding, and the same complaints with truth might still be repeated. Amongst all descriptions of stock more uniformity of type and general excellence are observed; fewer faulty or exceptional animals are entered, but in all classes a larger proportion are over-fed. Horses have probably undergone less change than other animals. Competition is, however, extended; classes have been opened for hacks, cobs, and ponies, which now constitute great attractions. The heavier draught horses are arranged under the threefold division of Agricultural, Clydesdale, and Suffolk. Four gentlemen sufficed to judge 98 horses in 1855, and concluded their awards before noon. This year twelve gentlemen in four divisions adjudicated on 52 classes, comprising 470 animals, and two of the divisions did not finish their arduous work until 6 P.M. The Showyard arrangements have been modernised and improved. The animals are more comfortably sheltered and provided for, and not least important, the judging during the last twenty years has been done in public, to the great pleasure and profit alike of breeders and amateurs. The extended proportions and wider teaching of the present exhibition may in some degree be estimated by the relative length of the official Report, which, including the opinions of the Judges, was in 1855 included in three pages.

The present Showyard was well chosen, conveniently near the city, occupying 65 acres of the meadows on either side of the Caldew, a tributary of the Eden. The two portions of the Yard were connected by two bridges. The levelling, draining, and water-supply left nothing to be desired. Shrubs, flowers, and ornamental grass-plots added to the amenity of the river banks. The arrangements for the comfort of the stock, for the judging, and for the convenience of the public, were admirably carried out. Not a hitch nor accident occurred throughout the Show. As at Kilburn, the weather alone was adverse. On the Monday afternoon, while the Judges were still busy, a heavy thunder-shower drove every one under shelter of the well-stretched canvas roofs, and all work was suspended for half-an-hour. Before midday on Tuesday rain again fell abundantly; more rain on Wednesday; and still more on Thursday, sadly marring the enjoyment of the 50,000 people who, undeterred by dripping weather and mud, came on Thursday to see the great agricultural fair. Ladies in waterproofs and strong boots trudged boldly about. On Tuesday and Wednesday fears were entertained lest the Caldew, overflowing its banks, might flood the Show-ground. The resources of the executive, as at Kilburn, were called into requisition in providing ballast, tan, sawdust, and planks to render the roadways tolerably passable. Owing to the wet state of the ground it was impossible to carry out the programme and have the daily parade of horses and cattle. Despite rain, low temperature, and wet forage, the health of the stock was particularly good. A few horses had staring coats and coughed, one or two cattle suffered from indigestion, but only one animal had to be removed to the hospital; and, thanks to the skilful supervision and preventive measures of the veterinary staff, no serious or mortal sickness occurred. During the earlier rainy days of the week some of the horses only could be brought out. From their boxes and stalls they filed—the prize-winners first, the others in order of the Catalogue. They were marshalled into one of the judging-rings, a semaphore showing at the stables when another detachment was required; whilst without noise and by a nod from the Steward in charge, the signalman at another semaphore gave the order for entrance into the grand parade-ring, around which 5,000 persons were comfortably seated under cover. Around both rings and by the side of the connecting alley, notwithstanding the unpropitious weather, anxious crowds were gathered four to six deep. Animals posed in quiet rest are interesting, but in active movement the attractions of "the thing of life" are greatly enhanced. When fortunately on Friday the rain ceased, the sun shone forth brilliantly, and the whole of the horses and a large proportion of the cattle were paraded in the great ring, instructive opportunity occurred for critical examination, the magnificence and variety of the Show were fully realised, and the enthusiastic public testified what crowds would have trooped in had the weather during the earlier part of the week been more favourable.

HORSES.

Horses, alike in number and quality, formed one of the most striking features of the Show. The entries were the largest the Society has ever had, with the single exception of last year at Kilburn. Agricultural horses—subdivided as Agricultural, Clydesdale, and Suffolk—mustered 27 classes and 227 entries. Some of the prize animals were magnificent specimens of symmetry, power, and quality. Clydesdales, conveniently near the land of their nativity, were not so numerous as might have been anticipated, and, in spite of liberal prizes, fell short of the numbers usually forwarded to the Highland and Agricultural Society Shows. The 83 entries were, however, not far behind the total number of horses exhibited at Carlisle in 1855. Most of the classes contained superior animals, and the three practical Judges, well conversant with the sort, got through their work promptly and satisfactorily. Suffolks, in fewer hands, were a select show, comprising many of the best representatives of the breed. Several of the classes for Hunters, and especially those containing the youngsters, were admirable. Stallions for getti hacks and ponies, and most of the Hack and Pony classes, were particularly good.

The subjoined *vidimus* indicates the entries of the different descriptions of horses at Carlisle and at the five previous Shows:

	Agricultural.	Clydesdale.	Suffolk.	Thoroughbreds, Coaching, and Hunters.	Hacks and Ponies.	TOTAL
Carlisle	114	83	30	138	104	469
Kilburn	221	82	77	152	181	713
Bristol	77	20	11	120	116	344
Liverpool	142	45	27	60	92	366
Birmingham	122	27	35	127	112	423

AGRICULTURAL HORSES.

Agricultural horses in some classes were poorly represented. Competition was particularly restricted in the divisions devoted to the older and three-year-old stallions, and again amongst the mares with foals. The prize animals generally reached a high standard of merit. Some of the victors at Kilburn and other Royal Shows had here to content themselves with subordinate places. Many of the classes, however, exhibited too much diversity of type. Softness of constitution, roundness of bone, short stumpy pasterns, and small weak feet were the frequent defects. The registration of pedigrees and the publication of the Studbook will, however, give prominence to the best and stoutest strains of good blood, and help to extend a higher standard of excellence. Some of the exhibits were overfed, and appeared as if their chief function were aptitude to fatten rather than power, endurance, and action. This cultivation of beef and fat perpetuates softness and delicacy of constitution—two of the most flagrant faults that any horse can have. Early forcing has filled the hocks of several well-grown young animals and also brought out ring- and side-bones, for which several were disqualified. Such hereditary defects should not be tolerated in breeding animals, and might be entirely got rid of were care taken in the selection of sound parents. In the Agricultural classes were placed a good many Scotch-bred horses of Clydesdale character, although not always qualified for entry in the Clydesdale Studbook. Superior English mares, with their well-turned, blood-like quarters, crossed with hardy Clydesdale sires, with stout legs and feet, produce animals unite many of the good qualities of the two rival sorts.

Agricultural Stallions, Class 1—four years old and upwards, not qualified to compete as Clydesdale or Suffolk—made a muster of four, a great falling-off compared with the thirty entered in the corresponding class at Kilburn. The Judges had no difficulty in giving the first place to the Earl of Ellesmere's "Admiral," a magnificent bay four-year-old, bred by Mr. J. Milner, Treales, Kirkham; sire, "Honest Tom," dam by "British Ensign." He was first as a yearling at Newcastle; first this year at Islington, in a class of 36, and gainer of the Champion Cup; first at the Bath and West of England, and at the Pomona, winning indeed wherever shown. He stands 17 hands high, girths 8 feet, has a beautiful head and crest, a shapely massive body carried on stout good legs, and moves well in all his paces. He tapes 12½ inches round the flat limb below the knee. Another year will drop his flank and give more second-thigh. "Young Champion," the thirteen-years-old veteran of the Stand Stud Company, made his ninth appearance, as usual was second, showed immense substance, constitution, and fair action, and seemed to go sounder than at some former Royal Meetings. Mr. Lawrence Drew's "Lord Harry," after his "Prince of Wales," second in the same class at Kilburn, lacks the ponderous massiveness of his successful rivals, but has a good middle, fine action, and wearing legs, withal rather short both of bone and hair. Mr. David Riddell's four-year-old "Roseberry," bred at Merryton, although first at the Highland Society's Perth Meeting last year, and champion at Glasgow, has not the substance of the English horses, whilst his appearance is somewhat injured by capped hocks.

Agricultural Stallions (Class 2), three years old, numbering 28 entries at Kilburn, were represented by three useful colts. Lord Ellesmere was first with "Samson 4th," after the redoubtable "Samson," from an "Honest Tom" mare; a big substantial colt already measuring nearly 17 hands, girthing 8 feet, measuring 10¾ inches below the knee, with good action, his white legs unfortunately, however, being rather too staring. He had the first prize in his class and the Champion Cup last year at Kilburn, and was first at the Lincolnshire, Yorkshire, Pomona International, and other shows. Captain William Hammond Betts' "Strawberry Wonder," a massive thick sire with great bone and in high condition, beat Mr. Frederick Street's "Somersham Samson," third last year in a class of 30 at Kilburn, and a promising colt, shown in useful working trim.

Agricultural Stallions, two years old, not qualified to compete as Clydesdale or Suffolk (Class 3), included, nevertheless, several entries with marked Clydesdale character, and two clever poor colts from well-known Clydesdale studs. Despite several leggy animals and some with weak joints and full hocks, evidently the result of over-feeding, the class, which numbered 19 entries, four of which were absentees, was generally commended. The Earl of Ellesmere had his two beautifully-got-up Cambridgeshire-bred colts placed first and second. "Worsley Wonder," receiving first honours, is a handsome colt promising to develop into a grand horse. His stable companion, "Prime Minister," has not stood training, is gummy in his legs, full in his hocks, and not very good in his pasterns. A more useful horse is the Stud Company's "Crowland Hero," after "Gant's Honest Tom," bred in Lincolnshire, and second at the Islington Cart Horse Show, where he was purchased by the Stud Company. Mr. Charles Marsters, of Saddle Bow, Norfolk, had a highly commended and also the reserve card for a useful stout Welsh-bred chestnut, first at the Bath and West of England; and he stood well in with another colt of somewhat similar breeding. The executors of the late Edward Pease, Darlington, had a highly commended card for a smart kindly growing bay with good legs and feet.

The class for Agricultural Mares and Foals (No. 15) contained only Lord Ellesmere's handsome pair. "Damsel," dapple-brown, seven years old, from Lincolnshire, with a good foal by "British Simon," was first, as she was at Manchester, Worcester, and many other Shows. "Flora," brown, seven years old, bred near Birmingham, the *première* mare of the Liverpool Royal, is scarcely so big, has shorter quarters, but very good action. With brood mares such as these, and five-and-twenty more which during the last six years Capt. Heaton, Lord Ellesmere's indefatigable agent, has collected at Worsley, and with such sires as the "Samsons," "British Wonder," "Heart of Oak," "Admiral," "Pride of the Isles," and "England's Glory"—all, with the exception of "Heart of Oak" (which was never exhibited), being Royal winners—this grand stud must make its mark and improve the size, power, action, and value of English agricultural horses. Although only exhibited at the Royal and a few of the more important county meetings, Lord Ellesmere's horses in six years have received 243 prizes. At the present Show 16 entries were made and 10 prizes won.

Mares, four years old and upwards (Class 18), paraded fourteen superior animals, more than half of them Clydesdales, and occupied the Judges for fully an hour. Eventually first honours were awarded to Mr. Thomas H. Miller's four-year-old "Princess Dagmar," by "Honest Tom," a big wide mare near the ground. The Earl of Ellesmere's six-year-old "Lady Worsley," a grand stylish animal a little low in the back, was second, whilst third honours fell to Mr. James Pickens' five-year-old "Young

Darling," which is said to have won forty-three first prizes, and barring lightness through her heart has all the points of a perfect cart-mare. Many Judges would have placed her at the head of the class. Next in order of merit stood Mr. Thomas H. Miller's "Black Topsy," first last year at Kilburn, a beautiful level mare but rather wanting in bone. The class generally was highly commended, but particularly noteworthy were Mr. James Cunningham's stylish four-year-old "Evelyn," and Mr. Thomas Atkinson's powerful five-year-old "Miss Linton."

Agricultural Fillies, three years old (Class 19), turned out ten tolerable animals over which the Judges deliberated long, placing Mr. Edward Holmes's big massive chestnut first, and Mr. Robert Horsley's powerful substantial chestnut-roan second—both immense three-year-olds, shown in very high condition, but wanting alike the style and action of Lord Ellesmere's "Princess Victoria," which was third, the gaiety of her stable companion, "Hebe," and the wearing legs and usefulness of Mr. John Fox's Clydesdale-looking "Flower," which had the reserve card.

Agricultural Fillies, two years old (Class 22), notwithstanding the proviso "not qualified to compete as Clydesdale or Suffolk," made a polyglot collection of thirteen animals, comprising English-bred, Clydesdale, and Welsh, and amongst them several big promising fillies disfigured by short stumpy fetlocks, and flat bad feet. The Rev. Vincent O. Holcroft's chestnut, "Empress," with good body, but rather narrow and leggy, was first. Another chestnut styled "Beauty," from Blaydon-on-Tyne, made an indifferent second. The Earl of Ellesmere's useful "Thistle" was third. The Duke of Westminster's well-grown "Lively" wanted bone and had weak shelly feet. Mr. George Street's pair of growing roans had the bloom rubbed off them by a tedious journey from Bedfordshire.

Agricultural Fillies, one year old (Class 25), apparently without provision as to breed, were another weak lot. Mr. George Shadwick's big somewhat leggy "Darling" was first. "Meta," the property of Mr. Thomas H. Miller, has size and good joints, which placed her second; whilst her black stable companion, "Satanella," more compact and short in the hind-quarters, was third. Mr. L. R. Duckworth's useful growing filly, with stout black legs, but rather small feet, remained unnoticed.

Pairs of Agricultural Horses, Mares or Geldings, four years old and upwards, not less than 16 hands high, which at Liverpool made a grand display, here, as at Kilburn, produced but three entries. The prizes in this and the five subsequent classes were liberally offered by the Carlisle Local Committee. Mr. John Waddell's well-matched imposing pair of Clydesdale mares were first. The seven-year-old "Countess" has been a frequent prize-winner both in England and Scotland. "Mary Grey," the four-year-old, was first in her class at Glasgow. The Earl of Ellesmere's strong massive pair were second. The other competitors were disqualified on account of side-bones.

Agricultural Geldings, four years old, not less than 16 hands high, had only six competitors for three good prizes. A crack cart-horse neighbourhood, like that of Carlisle, should have produced a larger and better competition. Amongst the lot it was difficult to find three sound serviceable animals. Mr. Henry Lawson's "Clyde," bred at Thirsk, has a good head, carriage, and barrel, but is not over stout on his limbs. Mr. William Bell, Carlisle, was second with "Prince," a deep powerful bay, a good mover, with a weak neck, and evidently of Clydesdale extraction. Mr. Edward Charlton's big yellow bay, with wall eyes and short quarters, was third.

Agricultural Geldings, three years old (Class 33), made muster of three. The first was short in his body, with good quarters; the second, with more style, was curby in his hocks.

Agricultural Geldings, two years old (Class 34), brought out six competitors. Mr. George Armstrong's first-prize "Tom" is a well-balanced bay, with good back, loins, and legs. Mr. Thomas H. Miller's second-prize has useful limbs and good action, but is rather pony-like. Mr. Thomas Robinson's third-prize is big, but leggy, and does not get his hind-limbs well underneath him.

Agricultural Colts or Geldings (Class 35) made a tolerable show of seven. Mr. Charles Marsters' "Coming Wonder," bred at Welshpool, first at the Norfolk and Oxford Shows, was readily chosen as the best, and will make a useful horse, although his shoulders will always be upright, and his fetlocks short and stumpy. Mr. John Whitehead's black is leggy, plain and rough in his fetlocks, small in his feet, and not so serviceable as the Messrs. Crawford's reserved number, and Mr. Thomas Miller's bay, which, although in ordinary condition, has stout legs and feet.

The Judges made the subjoined Report:—

The Judges, in handing in their Report to the Society, beg to state that in the matter of Agricultural Horses (other than Clydesdales or Suffolks) Classes 1, 2, 3, 15, 18, 19, 22, 25, 31, 32, 33, 34 and 35, were all fairly represented.

In CLASS 1—*Agricultural Stallions four years old and upwards*—No. 3 is a horse of rare quality, and it required but little consideration to place him in the first position, being a good mover, with much bone and substance.

CLASS 2.—*Three-year-old Stallions*—A small entry, but of fair merit.

Class 3. *Two-year-old Stallions.*—We had some horses which, although never having been placed in the prize-list, are likely at no distant date to attract some attention.

Class 15. *Mares and Foals.*—Although only two entries, we considered them of sufficient merit to enable us to award a second prize with the consent of the Steward.

Class 18. *Mares four years old and upwards.*—We are of opinion that this was the most superior class which we had to adjudicate upon, and that they are, with few exceptions, very superior animals, and cannot be too highly commended.

Class 19. *Three-year-old Fillies.*—These were well represented, 12 competing, including some first-rate animals; two roans, Nos. 135 and 136, obtaining first and second prizes, and possessing great power and substance.

Class 22. *Two-year-old Fillies.*—No. 166 is a good-looking full-sized filly.

Class 35. *Colts one year old.*—Nos. 280 and 276 are two very promising animals.

Thomas Girling.
John Lumsden.
Wm. Wood.

CLYDESDALES.

Clydesdales have extended from their Lanarkshire and Renfrewshire home throughout Scotland. They are popular in Cumberland and many of the northern English counties. Their smartness and activity, and special adaptation for one-horse carts and pair-horse ploughing, have led to their use for crossing the slower breeds of other countries. At prices reaching 1000 guineas, stallions have been sent to the colonies and the United States. Large numbers of geldings and mares are purchased by the English railway companies and great carriers for their heavy town work. Messrs. Pickford and Co. now employ in London alone nearly 1000 Clydesdales, brought directly from the North, at prices ranging from 70*l.* to 100*l.* They find them particularly hardy, lasting, and sound in the legs and feet. They stand better than other sorts the bucketing of hard town work. In a spring van a pair of those willing animals move off cheerfully at four miles an hour, often with four tons behind them. They are not readily shaken or lamed, although trotted home, as they often are, with the empty van. As with other breeds, Clydesdales of late years have been improved in quality. Retaining their well-placed shoulders and good carriage, they have more size, flatter legs, finer feathering of hair, better feet, and less liability to weed and grease. Many of the crack breeders were represented at Carlisle. Mr. Lawrence Drew contributed five entries. Mr. John Waddell and Mr. David Riddell each sent eight.

Clydesdale Stallions of four years old and upwards (Class 4) had seven representatives. Far away the best was Mr. David

Riddell's "Darnley," bay, eight years old, bred by Sir W. Stirling-Maxwell, Bart., successful in many showyards, but placed second last year at Kilburn to Mr. Buchanan's "Druid." After a hard season's serving he showed fully as well as he did twelve months ago; has the sound wearing pasterns and feet which Clydesdale men so strongly insist on, and is proving himself a superior sire. Two of his daughters and one of his sons were at the head of their respective classes. The Judges report him to be "an exceedingly good animal. He moves well, has excellent feet, pasterns, and bone, and is altogether a horse of first-class Clydesdale character." The second place was taken by Mr. William Moffat's "Prince Henry," the Carlisle district horse of this season, smart, but wanting middle and back ribs, and short in his quarters, defects which, being only four years old, he may somewhat outgrow. Third honours were gained by Mr. Moffat's "Young Baldie," which is better ribbed up, but has not particularly good quarters, pasterns, or feet. He has travelled this year in the Hexham district. The other competitors in this class lack the quality which is almost as necessary in a high-priced cart-horse as in a nag.

Clydesdale Stallions three years old (Class 5) were not largely or remarkably represented. Clydesdales at this age are apt to look leggy, and have scarcely begun to furnish. Mr. Andrew Montgomery was first with "Prince Imperial," second at Kilburn, and first at the Dumfries Union Show, a level smart colt, with good feather, but rather flat feet. Messrs. Crawford's second-prize "Silver" is a useful colt, rather light in bone.

In the next class (No. 6), for two-year-olds, Mr. Andrew Montgomery was again in front this time with "The Macgregor," after "Darnley," with capital legs and feet, a little plain about his head, but first at Ayr and Glasgow, where he won the cup; a handsome colt, of great quality, style, and promise. The promising well-bred entries of Messrs. Andrew MacDowall, David Riddell, and William Miller were ranged in the order mentioned.

Clydesdale Colts or Geldings one year old (Class 36) made a procession of 14 useful youngsters. Selection was first made of Mr. John Waddell's big strong yearling, with capital knees and hocks, but a trifle thin in his neck, and upright in his shoulders and hocks. Next in merit came Mr. James MacQueen's "Robin Hood," with particularly good head, legs, and feet. Mr. John M. Martin's stylish bay was third. Mr. David Riddell's first-prize yearling at Glasgow and Dumbarton had been ailing, and had lost its hair, but received a commendation. The Hon. G. Waldegrave-Leslie and Mr. Andrew Montgomery also had commendations for big growing yearlings. Mr. Drew's pair were scarcely up to showing condition. Two colts, which otherwise might have been distinguished, were unfortunately lame.

Clydesdale Mares and Foals (Class 16) sent only four out of the seven entries, and were headed by Mr. David Riddell's three-year-old improving mare by "Darnley." Mr. Robert Fredrick's seven-year-old, "Young Mary," came next, with great substance, length, and carrying herself well. Mr. James Beattie's five-year-old neat compact "Rosy" stood third, while her stable companion, "Duchess," gained the reserve card.

Three-year-old Fillies (Class 20) mustered a useful lot of half-a-score. Mr. John Waddell's "Louisa," after "Darnley," was first, and, although a little light in her bone, was probably the best Clydesdale mare at Carlisle. A worthy competitor for the second place was Mr. McDowall's "May Belle," with such shoulders, back, and loin as are seldom seen in a three-year-old. Mr. R. Loder's "Darling 3rd," bred in Kirkcudbright, is a strong, lengthy growing mare. Mr. James Beattie's reserve filly, with many good points, has a washy bay colour and somewhat upright hocks. The Prince of Wales' big growing mare, bred by Mr. Lawrence Drew, and presented to His Royal Highness two years ago, although first in her class at Kilburn, here dropped down amongst the unnoticed crowd.

Two-year-old Fillies (Class 23) were still more numerous and meritorious. Ten of sixteen entries put in an appearance; Mr. Robert Murdoch's bay "Princess" was the first choice—a shapely filly, with length and substance, flat wearing legs, and nice feather, her white stockings rather detracting from her beauty. Sir Michael R. Shaw Stewart's second-prize filly, bought last year at a high figure from Mr. J. Ross, has size and quality, moves well, but drops a little in her back. Lord Arthur Cecil, who also contributed several capital Clydesdales in other classes, was here third, with a light bay, of good character and great promise.

Yearling Fillies (Class 26), numbering 13, were also particularly good. Mr. James Beattie's brown "Duchess" has style, but scarcely so much bone as the second winner, Sir Michael R. Shaw Stewart's "Leonora," specially remarkable for size, strength, and good action.

The full and critical Report of the Judges is appended:—

Clydesdales were not so numerously represented as we had hoped to see them, but the prize animals are good types of the breed. The first-prize *Aged Stallion* is an exceedingly good animal. He moves well, has excellent feet, pasterns, and bone, and is altogether a horse of first-class Clydesdale character. The remainder of the class are much inferior to him.

The *Three-year-old Stallions* were a fair class, the first- and second-prize horses being very good animals.

The *Two-year-old Colts* were a large and good class, and the same remarks apply to the first- and second-prize horses in this class as in the preceding one.

The *Yearling Colts* were a large class, and the prize animals are fair specimens of the breed. One of the best in the class was unfortunately lame.

Brood Mares were not numerously represented. The first-prize mare being only three years old appeared small, but she promises to grow into a very handsome mare. She moves well, and has good feet, pasterns, and bone. The second-prize mare is a big roomy animal, possessing true Clydesdale character, but is a little deficient about her fore-feet.

The *Three-year-old Mares* were a fair good class as a whole, the first-prize mare being particularly good; the second- and third-prize mares are also very good.

The *Two-year-old Fillies* were an exceedingly good class, the first-prize mare being, perhaps, as true a specimen of the Clydesdale breed as was in the Show-yard.

The *Yearling Fillies* were also a very good class; the first, second, and commended fillies are very superior.

DUNCAN MCFARLANE.
A. MITCHELL.
ANDREW RALSTON.

SUFFOLKS.

Throughout the Eastern counties Suffolks maintain their prestige, are prized as useful plough-horses, and attest, in uniformity of appearance and colour, the pains bestowed in their breeding. Recording their descent, as is now done in a special Studbook, will further ensure cultivation of the best strains and permanence of type. Twenty-nine animals were entered in six classes.

Four-year-old Stallions (Class 7) were headed by Mr. Richard Garrett's "Cupbearer 3rd," a wonderful topped horse, carrying himself admirably, and winner not only at many local competitions, but also at three previous Royal Shows. Mr. Horace Wolton's "Royalty," long, showy, but wanting in second thighs, and small in his hocks, was second. Mr. Richard Garrett's handsome dark chestnut "Crown Prince" was third. Three-year-old Stallions (Class 8) testified to the condition in which Suffolk men can bring horses into the ring. Mr. Samuel Wolton's "Chieftain" is a fine growing colt, rather upright in his shoulders. Mr. Richard Garrett's more compact "Zulu" made a good second. Two-year-old Stallions (Class 11) were marvels of early development and good feeding. Mr. Horace Wolton and Mr. William Wilson took the honours. Suffolk Mares and Foals (Class 17) were deservedly commended. The Duke of Hamilton's "Bright Diamond," the prize mare of last year, only reached the third place; her stable companion, "Belle of the Ball," a more level, stylish mare, with a promising foal, being first, and Mr. Horace Wolton's "Empress of Paris" second. Suffolk Fillies three years old (Class 21) contained several of the Kilburn prize-winners. Mr. Samuel Toller, of Letheringham Lodge, had the first and second prizes, and Mr. R. E. Lofft was highly commended, and had the reserve ticket. Mr. Samuel Toller contributed the three two-year-old fillies which made up Class 24. They were shown in very high condition, but appeared top-heavy, with weak sickle hams, while the second-prize filly had also calf-knees.

The Judges reported as follows:—

In CLASSES 7, 8, 9, 17, 21 and 24 we had a very good representation of the Suffolks, 30 entries in all, with few absentees.

In the class of *Stallions over four years old*, we were so far impressed with the merits of three of the competing animals that we considered it due to the exhibitors that a third prize should be awarded, although, according to our instructions, this was not to be forthcoming unless more than four animals competed; but on representing our views to the Steward he most willingly agreed to our proposition, and we were consequently enabled to award a third prize in this deserving class. The first prize went to Mr. Garrett's "Cupbearer 3rd," a well-known horse in the prize-ring; the second prize to Mr. Wolton's "Royalty," a winner of many prizes at previous Royal Shows; and the third to another of Mr. Garrett's horses, "Crown Prince," of the "Cupbearer" strain, a hardy wear-and-tear animal. In the class of *Younger Stallions* (three years old) we had little difficulty in placing Mr. Wolton's "Chieftain" first (a grand animal), and Mr. Garrett's "Zulu" second, both of the "Cupbearer" strain. The *Two-year-old Class of Suffolk Stallions* brought a very fair lot of colts before us. The first prize went to Mr. Wolton's "Oriental," and the second to Mr. Wilson's "Vanguard," and Mr. Lofft's "Jove" obtained the reserve number.

The classes of *Suffolk Mares and Fillies*, 17, 21, and 24, for uniformity of character and colour, were a marked contrast to the corresponding classes of the Agricultural breed, and consequently occupied much less time. The Duke of Hamilton and the Messrs. Toller were well to the fore with some very fine animals that looked quite equal to perpetuating the best qualities of the breed, and thus doing good service to their owners and the country.

THOMAS GIRLING.
JOHN LUMSDEN.
WM. WOOD.

THOROUGHBRED STALLIONS AND HUNTERS.

Thoroughbred stallions suitable for getting hunters, as is too frequently the case at such exhibitions, are disappointing. Neither the *éclat* of Royal honours, nor the prizes, even when they were larger than now, suffice to bring out the stout, shapely, sound sires which can be confidently used for getting hunters or coach-horses. Risks of cold or accident after a week's camping-out must always restrict this competition. To the breeding of many of the exhibits no exception can be taken; in many pedigrees appear the names of horses that have had a high reputation on the Turf. To no other source, excepting the thoroughbred, can the breeder resort for endurance essential for all fast work. But he demands also stoutness and soundness. Speed at an early age, the great racing desideratum, is difficult to conjoin with the stoutness necessary in the sire of hunters and coach-horses. Somewhat undersized, quickly maturing thoroughbreds, able to stand early training, and at two and three years old earning money and reputation, are perhaps naturally preferred by most Turf men. Such delicate daisy-cutting tits, unable to carry 12 much less 15 stone across country, are unsuited to produce valuable weight-carriers, with well-laid shoulders, stout fore-legs, and ample chest capacity. The limbs, besides being slender, are sometimes also unsound. Hereditary defects, which are reproduced and mar the usefulness of the progeny, are also frequent. With the difficulty of getting suitable sires no wonder that the percentage of weeds and misfits is provokingly large, that breeding light-legged horses is pronounced a lottery, with more blanks than prizes, and that British horse-fanciers turn their attention to the breeding of cart-horses.

Three prizes, amounting to 85*l.*, attracted seven entries for Class 10, six of them chestnuts. Decidedly the best was "Meteor," seven years old, shown by the Stand Stud Company, Whitefield, Manchester, bred by Sir George Cholmley, Bart.—a smart compact horse, with fair action, but rather deficient in substance. Of much the same stamp is Mr. H. F. Clare Vyner's second-prize horse, "Duc de Beaufort," bred by Count de Lagrange, eleven years old, a gentlemanly looking chestnut, first last year in this class at Kilburn, still disfigured by the Hampton Court throat, whilst string-halt in both hind-legs becomes more unpleasantly conspicuous. Possessing such a serious hereditary fault, no animal, however otherwise meritorious, should receive Royal honours.

Desirous to maintain the reputation of the county for stout serviceable hunters and coach-horses, the members of the Cumberland Hunt liberally offered (Class 11) 100 guineas for the Thoroughbred Stallion which shall remain in the county during the season of 1881, and serve half-bred mares at a fee not exceeding 3*l.* 3*s.* The prize evoked seven entries, but none were particularly good. Several that had substance lacked quality. Some with fair style were deficient in timber. Not one had the well-placed shoulders, the stout fore-legs, and the action so essential in a good nag. After a patient balancing of merits and demerits, and disqualifying one otherwise useful animal on account of hereditary unsoundness, the Judges gave the award to Mr. William Taylor Sharpe's "Merry Sunshine," bay, ten years old, bred by Mr. Merry, of Russley Park, sired by "Thormanby," a nice topped horse, but upright in his shoulders, and weak in his fore-legs. The reserve card was handed to Mr. Armstrong's "Westerhall," by "Laughing Stock"—a horse with fair quality, better shoulders, and stouter limbs. Mr. John Jackson's "Bondsman," bred by the Duke of Newcastle, although somewhat plain, has size and strength, in spite of rather upright shoulders, carries himself well, and looked like getting useful carriage-horses.

Hunter Mare and Foal, Class 27, contained nothing striking. Mr. C. H. Hart's ten-year-old "Achievement," stated to be sired by "Knowsley," dam by "Laughing Stock," was entered "breeder unknown." She was placed first; she has plenty of length and strength, upright rather lumpy shoulders, and by her side was a fine promising foal by "Murillo." Mr. Thomas Dixon's second-prize moves well. Mrs. Humble's five-year-old, placed third, has the best quarters and hocks of the lot.

Hunter Mare or Gelding up to 15 stone, five years old and upwards (Class 37), with three prizes, together worth 50*l.*, evoked thirteen entries, but, excepting the prize-winners, contained nothing noteworthy. Between the relative merits of the two handsome weight-carriers, so well known in many prize arenas, the Judges anxiously deliberated. The perfect manners, easy paces, and good looks of Mr. C. W. Wilson's "Rossington" procured him the coveted red ribbon. Many good hunting-men preferred, however, the better head, more sloping shoulders and corky action of Mr. W. H. Wakefield's "The Banker," first at Taunton, at Islington in 1875, and now returned to the possession of his breeder. Mr. John C. Straker's chestnut seven-year-old "Gambler," placed third, has immense substance and power, but like many of his class rather wants quality.

Hunter Mare or Gelding, Class 38, up to 12 stone, five years old and upwards, produced one of the most perfect hunters at Carlisle. This admirable animal, "Old Boy," black, ten years old, the property of Mr. John Blencowe Cookson, is shapely and smart, with a beautiful head gracefully carried, short stout legs, and possessing great liberty of action. Amidst the heavy ground, or in rounding the ends of the oval, no other horse went so strongly or picked up his feet so cleverly. Like many another good one his breeder is unknown, but it is stated that he is got by "Champagne." Beside him his competitors appeared to some disadvantage. The well-bred mare by "Laughing Stock," placed second, had long raking quarters, but was short in her neck, and did not walk well. The third prize, another black, is stout, more of a wheeler than a hunter, and labours in his gallop. Several other useful horses were sent in from the neighbourhood, but although doubtless good performers in the field, were generally deficient in quality.

Hunter Mare or Gelding, four years old, Class 39, marshalled a score, not half of them having the qualifications of hunters, one-fourth being coach-horses, whilst four or five might have fittingly figured as park-hacks. Several of the well-bred ones were weeds. Most of the stoutest wanted quality. Rightly placed shoulders, as usual, were difficult to find. Two musically trumpeted their coming. The choice fell on "Flower Girl," a wiry wearing chestnut, rather mean about her neck, carrying her saddle too forward, but a fine mover. Mr. Teasdale H. Hutchinson, almost equally distinguished as an exhibitor of hunters, Shorthorns, and Leicester sheep, was second with a substantial black gelding with good action. Third honours fell to the "Mystery," bred in Clonmel, second last year at Kilburn, a very good easy goer, on which a 13-stone man might enjoy a good day's sport.

Hunter Mare or Gelding, Class 40, mustered twenty promising hunters, with more levelness and quality than distinguished the older horses. First in order came the black-brown "May Fly," of well-balanced proportions, up to a heavy weight, of nice quality, somewhat disfigured by a kick on the hock. Next was placed "Æolus," of rare style and quality; "Juliet" made a good third, but is rather taken in below the knee. Mr. Thomas Robson's "Cyprian" is a big colt, near the ground, likely to become a very valuable hunter. "Jim," belonging to Mrs. Mary Ann Bell, who won six first prizes in the Hunting and Hackney classes, unfortunately had cold, was out of sorts, and had to put up with a commendation card—an honour also accorded to several others.

Hunter Mare or Gelding, two years old, Class 41. Descending in age the classes improved. Observation, careful selection, and the use of well-bred sires, it is to be hoped, more distinctly formularise the conditions of success, and somewhat reduce the elements of uncertainty. Amongst the juveniles there was more happy combination of substance and quality. The pick of this good class was "Clarion," bred by Mr. John C. Toppin, a big slashing colt, with great knees and hocks, and a grand stride. Mr. Thomas Dixon's well-bred filly has not the substance of "Clarion," nor of the third winner, Mr. Richard Hawkridge's promising black gelding.

Class 42, Hunter Mare, Colt, or Gelding, one year old, was generally commended by the Judges, and produced Mr. Thomas H. Foden's first-prize chestnut colt, sired by Duc De Beaufort—a grand stylish yearling, with wonderful quarters;

Mr. John Wilson Hodgson's more blood-like "Rose of Athol," and Mrs. Mary Ann Bell's highly commended chestnut, with half-a-dozen other promising juveniles.

The Judges presented the following critical Report of Thoroughbred Sires and Hunters:—

CLASS 10.—Very moderate. The first animal being the only one of any great merit.

CLASS 11.—Again very moderate, the finest being disqualified by the veterinary surgeon for lameness, and the prize horse being decidedly more adapted for getting coach-horses than hunters.

CLASS 27.—This was a fair class, but very small in number. The two first-prize mares were of considerable merit.

CLASS 37.—This was very small in numbers. The Judges regretted that there were no younger horses of sufficient merit to beat the old prize-winners. Too much attention to size alone appears to have been paid by breeders, without sufficient attention to quality.

CLASS 38.—This was a moderate class, with the exception of the first-prize-winner, who was a very first-class animal.

CLASS 39.—This was a moderate class, and again, although the animals were well grown, the Judges have to remark on a great want of quality.

CLASS 40 was a good one; the winners being good animals, possessing plenty of power, but being rather deficient in quality.

CLASS 41 was very good, the animals being well-grown and showing considerable quality; the first- and second-prize-winners, particularly, being of great promise.

CLASS 42 was first-rate, the yearlings being very well grown, and of excellent quality. The first-prize-winner was an almost perfect animal of his age. The Judges commended the whole class.

ROBERT ARKWRIGHT.
J. H. EDWARDS HEATHCOTE.
ROBERT GEO. F. HOWARD.

COACHING-HORSES.

Very little system is adopted in the breeding of coach-horses. They are usually chance productions, often appearing where hunters are the breeder's object. The best are the progeny of thoroughbred stallions put to clean-limbed active cart-mares, or to the better class of animals known as pole-vanners. Useful smaller cobby horses, under 15½ hands, are often the produce of good Norfolk trotters. The supply of handsome good-stepping coach-horses over 16 hands has long lagged far behind the demand. Dealers and job-masters cannot find in England or Ireland the animals they require, have had to ransack Hungary and Russia, and now discover in America a fair field for good stud-horses, five and six years old. Scattered throughout both Canada and the States are to be found big fine horses, with shape, action, breeding, and good legs and feet, procurable for about 40*l.*; costing, however, fully 25*l.* more for transport thence to this country, and then requiring careful breaking and management before they get used to English work and feeding. The coaching-horses at

Carlisle did not furnish much instruction, unless it be in what to avoid. The Judges remarked that "from the animals brought before them," they conclude "that the country round Carlisle is not a coach-horse-breeding district."

Stallions suitable for getting Coach-horses had a class to themselves (No. 12). Such a class, I believe, is, however, superfluous. The distinction between coach-horses and hunters has been considerably narrowed. Breeding and quality are as essential in the one as in the other. There is no demand now for big cumbrous carriage-horses of the old Cleveland bay type of forty years ago. Good roads, lighter vehicles, and the accelerated pace of travelling, call for smarter and better-bred carriage-horses, many of which would carry a man well across country. The Royal Agricultural Society are unwise to recognise coaching sires other than thoroughbred. Half-bred or chance-bred sires only lead to uncertainty and disappointment; they lack the power of reproducing a fixed type. None of the five coaching stallions at Carlisle reached a high standard. The Stand Stud Company own the first- and second-prize bays, both bred in Yorkshire, exhibiting much Cleveland character, but deficient in action. The first, a shapely three-year-old, has a good body and carriage; the second is slack in his back; Mr. Christopher Wilson's bay three-year-old has a better middle piece and truer action, but is plain about the setting-on of his head.

Coaching Mares and Foals (Class 28) commanded three useful entries, showing a good deal of Cleveland character, and likely with suitable thoroughbreds to produce superior carriage-horses. The first-prize rather lacks style, and is not very good in her hocks. The second mare has more substance. The third, shorter on the leg, has better back and loins than either of her compeers.

The Judges report as follows:—

The *Stallions suitable for getting Coach-Horses* (Class 12) were an indifferent lot, and wanting in one very essential point for a good coach-horse, viz. action.

In the Class for *Coaching Mares and Foals* (No. 28) there were two very useful mares shown, the winner hailing from Yorkshire, and being very much of the old Cleveland type.

The *Coaching Mares and Geldings*, four years old and upwards, were a very mixed class, the first- and second-prize animals being of a useful stamp, but many of the exhibits were of a nondescript kind.

Of the younger classes of Coaching-horses we cannot say much. The winner in the *Three-year-old Class* was a useful colt, and went well; the remaining entries being made up of animals which might many of them have appeared in the Hunter classes, with much more chance of success.

From the animals brought before us we should say that the country round Carlisle is not a coach-horse-breeding district.

John B. Booth.
Robert Clark.
George Higgins.

HACKNEYS AND PONIES.

Excepting in Norfolk and a few widely scattered districts, little pains are taken in the breeding of hackneys and ponies. If of the right stamp, no class of horses, however, pay better. Three figures are readily given for an ordinary riding hack, and a well-matched driving pair, suitable for the park, will bring 300*l.* Most parts of the country have a fair proportion of useful, stout, undersized mares, which could scarcely fail to produce valuable little horses, if put to hackneys of the type of Mr. John B. Barrow's "Young Perfection," or Mr. Christopher Wilson's "George 1st," or "Little Wonder." It is a matter of regret that the death of Mr. Wilson, senior, necessitates the dispersion of the High Park Stud, collected during the last ten years with such enterprise and judgment, and becoming increasingly valuable, as the good points of the little horses are fixed by careful breeding. In the successful management of his *multum-in-parvo* sort, Mr. Wilson has depended upon well-selected Norfolk trotters. Excepting amongst the old Shales strains it is, he believed, difficult to get true trotting action, and still more difficult to secure its transmission. His "George 1st" has given all he could wish in carriage and action. Other successful breeders of hacks and cobs prefer, however, occasionally to resort to a stout short-legged thoroughbred.

Stallions suitable for getting Hackneys, above 14 hands 2 inches and not exceeding 15 hands 2 inches (Class 13), were a capital muster. As at other recent Royal Shows, they exhibited considerable uniformity of type. The best came from familiar Norfolk trotting strains. They had a happy combination of substance, quality, and all-round action—essentials prominently illustrated in Mr. John Burton Barrows' "Young Perfection," six years old, bred by Mr. Utting, Melton Parva, Norwich, one of the most perfect horses at Carlisle, exhibited in beautiful condition and training. Daily he brought thunders of applause from delighted thousands, who around the ring admired his arched crest, proud mien, and true level action; and roared with laughter as, in symmetrical pedal unison, the "Young Perfection" and his agile comic attendant went gaily round the ring. Again and again applause saluted "Joe," as with prancing springing stride he started off, keeping pace and time with his favourite. Mr. C. Wilson had the second honours with a stylish bay, wanting, however, the substance of his rival. A very good, stout, straight chestnut, the property of the Stand Stud Company, made a capital third. The reserve number was a chestnut three-year-old, of good promise, belonging to Mr. William Featherby. One of the outsiders in this class was sold early in the week for 250*l.*

Pony Stallions, above 13 hands 2 inches, and not exceeding 14 hands 2 inches (Class 14), made a capital parade of a dozen, with five entries from Mr. Christopher Wilson, who made a sweep of the three prizes, reserve number and all, as he did last year in the corresponding class at Kilburn. "Little Wonder," well worthy of the name, was again at the head of the list. He is the very type of a perfect hack, has wonderful hock action, so difficult to secure in bigger horses, and at every stride seems to place his hind-feet 15 inches in advance of the fore-feet, getting gaily over the ground, and proudly shown by his stalwart attendant, whose long swinging pace carries him along by the side of his charge easily at twelve miles an hour. These little horses are in admirable training, stand as proudly as peacocks, arch their necks or extend themselves to order. They have great strength in proportion to their inches, capital legs and feet, and rare quality and action. After culling Mr. Wilson's prize lot several good ones still remained. Mr. Elliot, of Aspatria, had a ten-year-old imported chestnut Arab, with the best shoulders I ever saw on an animal of this old breed, with good action, and legs like steel. Mr. W. Sawer, of Keswick, had a strong Fells cob; and Mr. Tom Stephenson, of Barmston, a smaller useful pony, with good back and loins. In this and some other classes the Judges wisely directed attention to faulty shoeing. The crust is sometimes cut senselessly away, the heels unduly lowered, the soft frog ruthlessly slashed, and even the bars opened with the drawing-knife, and the crust freely rasped—malpractices which greatly reduce the strength of the feet, and notably increase lameness.

Hackney Mares and Foals (Class 29) were a very good lot of eight. "Maid-of-All-Work," shown by Mr. Charles Lancaster, although rather lacking style, was deservedly preferred on account of her useful wearing legs and good all-round action. Mr. R. Martin's "Lady Mary," which was second, Mr. T. H. Miller's smart "Arab," which was third, and the highly-commended "Mabel Grey"—were full of quality, but rather wanting in substance. Mr. C. Wilson's "Little Wonder," well shown, had the reserve card. Pony Mares and Foals (Class 30), three of the six entered by Mr. Christopher Wilson, made a capital parade. "Miss Constance," very smart and stylish, a miniature little hunter, and first last year at Kilburn, had the same position here; Mr. Wilson's "Dolly" was third, and between the pair was placed Mr. William Trotter's bay "Lucy," a thick, strong, beautiful mover, with a very nice foal.

"Lady Walton," who has lately gained a world-wide reputation as one of the most shapely hacks and finest movers in England, eclipsed easily her single competitor, in Class 46—for

Mare or Gelding exceeding 15 hands and up to not less than 15 stone. At the Islington Show of 1879, Mr. C. Wilson shrewdly perceived the taking qualities of this mare; purchased her from her breeder, Mr. Stiraker, of Walton, Yorkshire, for 250 guineas; put her into somewhat better form and training, and she has since been *facile princeps* wherever shown, and has earned in twelve months money prizes which have paid for her twice over.

Of equal merit as a hack, and first in the class (47) for Mare or Gelding, exceeding 15 hands, and up to not less than 12 stone, was Mr. C. Wilson's bay gelding "Sunbeam," with the contour and grace of a thoroughbred, and the shoulder, knee action, and manners of a perfect hack. Second in this good class came Mr. Wilson's "Silver Tail," roan, seven years old, very stylish and smart, but with less bone than many of her compeers. The breeder's name, as also that of "Sunbeam," is unknown. In this class, amongst a goodly number of useful local entries, were two stout hardy hacks, after the famous old "Laughing-Stock," who has been a long-lived example of the value of a well-bred sire, and of the capability of such a horse, with mares of suitable stamp, for getting hunters, coach-horses, and hacks.

In Class 48, for Mare or Gelding, above 14 and not exceeding 15 hands, and up to 15 stone, Mr. C. Wilson, who in some of these classes appears to have scared off competitors, secured the red ribbon for "Charles 3rd," a raking five-year-old that showed well with head and tail up; he moves grandly, looks at present rather more fitted for harness than the saddle, and is after that good Yorkshire sire "Denmark." The only other competitor in the class was Mr. Cargill's stout brown gelding from Langholm.

Class 49, Hackney Mare or Gelding, above 14 and not exceeding 15 hands, and up to 12 stone, contained a first-rate lot of twenty, characterised by the Judges as "the best they had before them." Mr. John Robinson's four-year-old chestnut "Water Lily," illustrating a happy combination of substance and quality, is a stylish good mover, and was deservedly first. Mr. F. C. Matthews's smart Driffield cob was second; Mr. Boulton's chestnut stout weight-carrier was third, but did not show so much action; Mr. C. Wilson's "Rod-in-pickle" had to rest content with the reserve card. With almost any one of the score a horseman might well have been content.

Ponies (Class 50) above 13 and not exceeding 14 hands, were a good muster of twenty, with many smart useful animals, the best the model of a little hunter, "Novelty," a brown gelding, seven years old, the property of Mr. William Foster, of Grove Villas, Pontefract—a good judge and most successful exhibitor. "Novelty" is believed to be got by Lord Calthorpe's "Don

Carlos," out of a little thoroughbred mare. He has beautiful shoulders, good legs and feet, and was one of the best all-round goers at Carlisle. He has taken upwards of fifty first prizes, and his owner is said to have last year refused 250*l.* for him. Mr. John Robinson's thick compact "Lord Silvertail" was second, and Mr. C. Wilson's stout "Little Jack," third.

Two classes (51 and 52) of Smaller Ponies, for which the prizes were handsomely provided by the Carlisle Committee, attracted fifteen entries, contained some very useful little animals, and were very popular with the public. Mr. Foster, of Grove Villas, Pontefract, had again first honours in both classes with his model little victors in many a well-contested arena. Mr. C. Wilson's "Multum in Parvo," about eleven hands, created much amusement by carrying briskly at a hand-gallop round the great parade-ring, amidst heavy mud, a six-foot Cumbrian, who weighed 15 stone.

The Judges made the following critical Report of the Hackney and Pony Classes:—

Hackney Stallions, over 14½ hands, not exceeding 15½ (Class 13), were a useful lot, but the feet of several were in very defective condition owing to bad shoeing, whilst in the *Brood Mare Class* (No. 29) were three or four mares which would have done credit to any showyard.

In the chief classes for *Riding Hackneys*, exceeding 15 hands and up to 15 stone, and not exceeding 15 hands and up to the same weight, the entries were small, only two exhibits appearing in each class; but probably the fame of Mr. Christopher Wilson's celebrated mare "Lady Walton," and his "Charles 3rd," which were the winners in their respective classes, deterred other people from entering.

The class for *Hackneys*, 14 to 15 hands and up to 12 stone (No. 49), brought out 20 entries, and was the best class we had before us, many of the exhibits being very superior animals and very fine goers; and the class for *Hackneys*, above 15 hands (No. 47), was also a very creditable one.

The Ponies were on the whole very good, many of them being very superior. And in the class for *Pony Stallions* (No. 14) we were surprised, after giving our awards, to find that the first, second, and third prize ponies, and also the reserve No., all belonged to the same owner, Mr. Christopher Wilson.

The *Riding Ponies*, above 13 and not exceeding 14 hands (Class 50), were a strong class, numbering 25 entries; the prize animals would take a great deal of beating in any showyard, and Mr. Forster and Mr. J. Robinson are the most fortunate exhibitors.

JOHN B. BOOTH.
ROBERT CLARK.
GEORGE HIGGINS.

CATTLE.

British cattle-breeders are evidently fond of variety. They are averse to have the living machine which yields dairy produce and beef cast in one or two Procrustian moulds. They multiply and cultivate new varieties, regarded as specially fitted for particular use, situation, or style of management. Purity of breed is jealously maintained; fixity of type is confirmed by in-and-in and by line-breeding; distinctiveness is further secured by chronicling in special Herdbooks the pedigree of the best animals. Within the narrow area of these Islands there are about twenty different breeds, all, excepting Highland and Welsh, the semi-feral Chillingham, and the sheeted Somersets, having been well represented at Carlisle. Shorthorns, Herefords, and Devons were as good, more uniform, probably better than at any former Show. Channel Islanders, considering the Northern *locale* of the Exhibition, were unexpectedly numerous, and of superior merit. Ayrshires, restricted in number, nevertheless illustrated well the profitable features of the Northern milking breed. Sussex, Scotch and English Polled, attaining more than a local celebrity, were excellent. Numbers as well as merit were well maintained. The Carlisle cattle entries in 1855 were 172; those of 1880 were 432. The Kilburn International entries were 930; those of Bristol 442; those of Liverpool 372; and those of Birmingham 465.

Following the order of the Catalogue, I shall endeavour to give a brief description of the Cattle Classes, and of some of the more striking of the prize-winners.

SHORTHORNS.

Shorthorns maintained their usual high position alike for numbers and merit. The Judges, Messrs. H. W. Beauford, J. W. Cruickshank, and A. Metcalfe, reported, "that the Show, both of male and female classes, was considerably above average. The female classes were exceptionally good; probably in the aggregate no better Shorthorns were ever exhibited at any Show of the Royal Agricultural Society. We have no special report to make, but must acknowledge the assistance received from the Stewards, which in the state of the weather was of much value." Eight classes comprised 146 entries, and compared favourably with former Shows, and even with last year's International; they were drawn from many parts of the country; as formerly, a few were sent from Windsor and Sandringham; some were contributed by breeders of world-wide repute; but a considerable number in satisfactory form were sent by men hitherto unknown to fame. High on the scale of merit stood animals of distinctive strains, such as Mr. T. H. Hutchinson's pure Booth cows and heifers, Mr. B. St. John Ackers' cows and heifers of Killerby descent, and Lord Fitzhardinge's Bates-bred "Wild Eyes" and "Darlington" yearlings. Numbers of the prize-winners were, however, of mixed descent. Not a few came from families which have attained distinction as pr winners—a fact which should give confidence to breeders prosecuting their difficult vocation, and induce them to begin and persevere with good sorts. Cumberland and Westmoreland, as already mentioned, sustained well the honours of their district, especially in the Bull classes.

Bulls over three years old (Class 53) comprised a dozen useful animals, nearly all of North-country descent, headed by the imposing massive "Duke of Howl John," bred and exhibited by Mr. John Vickers, of Mown Meadows, Durham. Although six years old, this white bull is active and serviceable; he is straight, wide, and deep; he girths 9 feet 1½ inches, weighs 26¼ cwt., and carries his beef well to his knees and hocks. His only prominent defect is roughness over the shoulders. Of nearly pure Booth blood, he is sired by "White Duke" of the Mantalini tribe, from the stock of Mr. Atkinson, of Peepy; the foundation of the pedigree is full of the finest Booth blood; "Priam," the earliest sire recorded, being the father of the celebrated Warlaby prize-winners "Bracelet" and "Necklace." Beginning his victorious career as a yearling, he has won many local honours, earned a high commendation at the Bristol Royal; last year at the Durham County he beat his present antagonists "Vice-Admiral" and "Rear-Admiral," and has been awarded nine silver cups in various showyards. Besides having the red ribbon as the best in his class, he gained the Champion prize, value 25*l.*, as the best Shorthorn bull at Carlisle.

Next on the roll of honour came Mr. Thomas Willis's "Vice Admiral," from "Windsor's Hyacinth," of well-known Carperby Booth blood, first in his class at three consecutive Royals. He is very level and shapely, without lumber, somewhat disfigured by feeble backturned horns, and poverty and hardness of hair. Mr. Willis's "Rear Admiral" has a better head, but is disposed to be patchy in his rumps, is barer over his blades than his younger brother "Vice Admiral," and although second in the senior class at Kilburn, he only took the fifth place here, a pretty good evidence of the superior quality of the Carlisle competition. Lord Ellesmere's "Attractive Lord," the popular champion of many crack county shows, and of the Bath and West of England, stood third, as he did at Kilburn. Some good judges outside the ring would, however, have given him the second, or even the first place, which he held at Bristol. He certainly showed more style than either of his more successful rivals, and has the well-bred head which so generally demonstrates impressiveness, but work and six years' training have taken from the levelness of his back and his bloom, while his great length leads to slackness behind the shoulder. Mr. John Relph's "Bright Duke," bred by Messrs. Dudding, fourth as a yearling at Liverpool, first at many local exhibitions, and at the Bath and West of England this year at Worcester, is a bull of great substance and masculine character, plain about his rumps, but in much better working condition than some of his competitors. Mr. John Elwell worthily received a high commendation for his "Bainesse Windsor," a great, good beast, rather patchy on his rumps, light in his girth, but the prizewinner of the Leamington, Stafford, and Worcester Shows. A number of useful bulls, prize-winners on both sides of the Tweed, were amongst the unnoticed. The Marquis of Exeter failed to forward his pair of "Telemachus" bulls.

Class 54—Bulls above two and not exceeding three years old—although mustering 18 entries, comprised few first-class animals, and several that are below mediocrity. "Prince Imperial," belonging to Mr. Thomas Nelson, of Keswick, although receiving the premier honours, lacks masculine character and size, has his tail set too high, and is weak in his hocks. Mr. W. Handley's Milnthorpe bull, "Master Harbinger," made last year a triumphant progress, winning seventeen first prizes, including first honours at Kilburn, and eight champion cups. He exhibits more size than his successful competitor, is level along his top line, girths 8 feet, but, growing fast, is a trifle leggy and light in his second-thighs. The third rosette was given to Mr. Thomas Willis's "Flag Officer," shown in high condition, remarkably good in his fore-chine and girth, but destined to be patchy. Mr. Robert Taylor's "Prince Louis," bred by Lord Moreton from a good old Sarsden sort well crossed with "Duchess" sires, exhibits growth, style, and a capital coat, but is light through the heart.

Yearling Bulls (Class 55) were a goodly collection of eleven, led by Mr. Thomas Towneley Towneley-Parker's "Oxford Rose," the first-prize bull at Birmingham in March, exhibiting a great deal of character and quality. Next followed Mr. David Pugh's "Sir Charles," a useful animal, not quite so level or good in his shoulders. Mr. S. P. Foster was the winner of the third honours with his level, smart, and promising Oxford yearling "Oxford Duke of Killhow 2nd," shown in ordinary condition. Another bull in low condition, belonging to Messrs. Lazonby, with nice hair, was placed fourth. The reserve ticket went to Mr. John Outhwaite's "Lord Zetland," a smart yearling, wanting in middle piece and hair. The Duke of Devonshire's pair of Oxfords were not forthcoming.

Bull Calves, above six and not exceeding twelve months (Class 56), made 10 entries. Mr. T. H. Hutchinson's "Knight of Kars" stood first—a promising calf, with wonderful flank and touch. Mr. Strong's level white "Goldsmith" was second.

Mrs. Fothergill's roan "Seraphina" bull came third; "Lord George Hamilton," from Prinknash, made a good fourth.

Cows in-milk or in-calf above three years old (Class 57) made a good entry of 18, displaying size, substance, and character; several, however, had their lines of beauty impaired by lumpy patchy quarters, and over-feeding. Her Majesty the Queen and his Royal Highness the Prince of Wales were exhibitors. Mr. Teasdale Hilton Hutchinson, of Manor House, Catterick, was first, with his seven-year-old "Grateful," of good Booth descent, winner at Kilburn, with a gay head, ample bosom and barrel, and fair touch; indeed, as a carcass of beef, excepting her lumpy hind-quarters, she is tolerably near perfection, and has moreover the faculty of transmitting her own good points to her progeny. Four of her relatives were amongst the best in their respective classes. Mr. B. St. John Ackers, of Prinknash Park, on the thin oolite of the exposed Gloucestershire hills, manages to grow hardy prize-winning Shorthorns, and in good company took the second place with "Princess Georgie," nearly six years old, of Killerby descent, a big useful cow, with a good udder, doing herself injustice in carrying her head low, and, like so many others, patchy in her hind-quarters. The sister cow, "Queen of the Georgians," the pick of the Liverpool Royal, had more style and presence than this good matron. Another Prinknash prize-winner, "Lady Carew 2nd," which was fourth at Kilburn, had here to put up with a high commendation; she is, nevertheless, a good big cow, with wonderful quality and touch, but is over-trained, and somewhat low in her back. The Earl of Tankerville's "Gaiety 3rd" is a long level cow, free from patchiness, carries herself well, but is lighter in her forehand than her more successful compeers. She was first at the Highland Society's show at Perth last year, and at Leeds and Dorn was preferred to "Grateful," but having been lame and lost her hair, she had only the third place at Carlisle. Mr. W. Langhorn, of East Mill Hills, came next, with his four-year-old "Diadem 2nd," successful at many local shows, and second at the Highland Society's Edinburgh Meeting; a long useful cow, rather uneven in her flesh, but testifying what good ones are bred in the locality. A very promising useful animal, not four years old, and in comparatively low condition, sent by the Duke of Northumberland, had the reserve card. Mr. Thomas Lambert, another of the successful Northumberland breeders, had a highly commended card for "Princess Louise," bred by Mrs. Eshton, Chesterwood Grange, Haydon Bridge—whence half-a-dozen very good exhibits have been derived—distinguished by her stylish head, wonderful bosom, and good back, but prevented taking a better position by her plain rumps.

Captain George Ashby-Ashby's four-year-old "Innocence," so successful in many showyards, retains her style and good hair, but her training has developed patchiness. Mr. James Whyte's three-year-old "Stanwick Rose" was also deservedly honoured with a highly commended card. The Duke of Richmond's "Chief Lustre," the second heifer at Kilburn, was here deemed only worthy of a commendation; whilst Mr. D. Pugh's "Czarina 12th," third at Kilburn, and Her Majesty's "Cawlina 9th," the reserve number of last year, received no notice at Carlisle.

Heifers in-calf or in-milk, not exceeding three years old (Class 58), made a first-rate parade of thirteen good animals. First in merit came Mr. T. H. Hutchinson's "Gainful," daughter of his prize cow, but bigger and wealthier, with better hind-quarters, and retaining much of the quality which distinguished her as the prize yearling of 1879. More compact, but smart, neat, and level, a little bare over the top and front of the shoulders, is Mr. William Langhorn's "Lady Anne" (half-sister to his prize cow), first at Barmpton, Berwick, and the County Carlisle of last year, second to "Gainful" at Perth, and taking the same position here. Mr. Pugh's "Tulip 4th," easily first at the Bath and West of England at Worcester, came third; her want of levelness being in part compensated for by her sweet head, kindly touch, and wonderful loin and flank. Mr. James Whyte stood fourth with a useful young heifer, "Gaiety 6th," not in high condition, first last year at the Highland Society's Perth Show. "Sweet Pea," the property of Mr. Evan Baillie, of Dochfour, had the reserve ticket, but is deficient in growth and hair. Lord Polwarth and Mr. Thom, Penrith, had high commendations.

Yearling Heifers, above one and not exceeding two years old (Class 59), the largest and one of the best of the Shorthorn classes, presented a brilliant galaxy of symmetry, style, and beauty. Lord Fitzhardinge contributed the pair of charming heifers which attracted so much attention last year at Kilburn, which maintain their good qualities, and undoubtedly testify to the value and impressive power of their 4500-guinea sire, the "Duke of Connaught." The red-and-white "Wild Eyes" heifer, winner at Kilburn, also at this year's Bath and West of England and Yorkshire Shows, leaves little to be desired. Running her very close was "Dowager 2nd" of the "Darlington" tribe, also very level and symmetrically moulded, with hind-quarters, hair, and touch even more perfect than those of her more successful companion. Third honours, after much consideration, and in the midst of a disturbing storm of rain, were awarded to Mr. Jonathan Peel's "Casquette," with a sweet head, well-rounded bosom, grand ribs and back, but plain ;

her hind-quarters, rather wanting in style, and very fat. Mr. John Elwell's "Princess Eugénie" showed more style and quality, and was placed fourth. Mr. Clement Stephenson's reserve heifer has admirable back and loins, but is light in her girth. High commendations were handed to Mr. B. St. John Ackers and to Mr. T. H. Hutchinson, while several other very good heifers might have been similarly distinguished.

The Calf Class (No. 60) contained 23 promising prodigies of early development, condition, and smartness. First came "Lady Georgina Newcomb," after "Lord Prinknash 2nd," a deep, thick, wealthy calf with good hair. Next to her stood the Rev. Robert B. Kennard's "Blossom 5th," of good Bates and Booth blood, with attractive coat and quality, but rather light in girth. Four months younger followed Mr. Joseph Stratton's "Ethelberta," a very neat compact calf in the prime condition which always characterises the Alton Priors exhibits, but her shaky full hocks tell of trying forcing. Mr. P. Ascroft's more lengthy calf, which came fourth, seemed leggy by the side of Mr. Stratton's. The Duke of Richmond's reserve heifer will probably make a better cow than several of those placed above her, although at present she wants condition and is slack behind the shoulder. Mr. H. Smith, of Castlebrack, Queen's Co., had a high commendation for his "Victoria 49th," a straight, deep, well-got-up calf. The Judges, not profuse in their honorary awards, commended Mr. Jonas Webb's smart "Babraham Rose 5th," and Mr. D. Pugh's "Czarina Manoravon."

HEREFORDS.

Herefords made up in merit what they wanted in numbers, and Mrs. Sarah Edwards, Mr. Aaron Rogers, Mr. William Taylor, Mr. J. H. Arkwright, and other spirited supporters of the sort forwarded some of their best animals. Although nothing came up to Mrs. Sarah Edwards' magnificent "Leonora," the premier Hereford amongst many strong classes at Kilburn, or Mr. William Taylor's "Tredegar," the champion of the Liverpool Meeting, there were some admirable level heavy-fleshed representatives of the Palefaces. In Australia and America Herefords are growing in reputation. On some of the great Western ranches they have mated well with Texan and native cattle; the half-breeds are compact, short in the leg, with good flesh and quality. Encouraged by these successes, during the present summer 400 good Herefords have been selected and exported by American stockmasters. Some of the exhibitors made considerable complaint on account of third prizes being withheld in several of the classes in which five entries were not forthcoming. But even the Royal requires in bad times to economise; and notwithstanding considerable merit, and much expense incurred in forwarding these animals so far from home, the Society is perfectly justified in adhering to its rules and withholding third prizes in classes which do not fill.

The four Old Bulls (Class 61) were grand imposing specimens of mountains of evenly distributed beef, carried very near the ground. Mr. Aaron Rogers's "Grateful" and Mr. William Taylor's "Thoughtful" were first and second, as they were last year at Kilburn. "Grateful," in an open champion competition at the Bath and West of England at Oxford in 1878, beat the famous prize-winning Shorthorn bull "Sir Arthur Ingram;" "Thoughtful" won the first prize in the Old Class at the Bristol Royal. More than three years' anxious care and skilful training have been bestowed on these repeatedly decorated prize-winners. Is the result commensurate with the expenditure of time and expense? Is it desirable for the Royal to encourage the continued maintenance of such animals in unprofitably high condition, and allow them year after year to win the same chief prizes? Would it not widen competition if in all breeds animals having gained a first prize should be ineligible to compete in subsequent years in corresponding classes for money prizes? Victorious animals which it may be thought desirable to keep before the public, in case of transcendent merit, might be specially rewarded with extra prizes or medals.

Amongst Bulls, two and not exceeding three years old (Class 62), Mr. John H. Arkwright was first with "Conjuror," a massive level bull, a trifle faulty at the setting-on of his tail, the first yearling at Kilburn, and first in his class at the recent Bath and West of England Exhibition at Worcester. The second-prize bull is narrow, hard in his hair, and plain in his scooped quarters. The yearlings were a better class, Mrs. Sarah Edwards obtaining, as she has repeatedly done elsewhere, the first and second awards for "President" and "Landlord." The calves were useful and shown with nice touch and hair.

In the Cow Class (65) Mrs. Sarah Edwards' "Perfection," exhibited in somewhat moderate condition, had to make way for Mr. Myddleton's "Nanette," of grand shape and character, big in her back and loins, girthing well, but with a dip in her back and somewhat short in her quarters. "Downton Rose," from Stonebrook House, first at the Bath and West of England, was the best three-year-old. Mr. J. H. Arkwright's "Gaylass 4th," placed next, is another marvel of heavy flesh. The younger classes were fairly represented.

The Judges recorded their awards in the following terms:—

CLASS 61, for *Bulls above Three Years old,* brought out four animals: "Grateful," a magnificent bull, was deservedly placed first, with "Thoughtful," another good bull, second; "Hartington," third, also a good bull, showing plenty of substance.

CLASS 62. *Bulls above Two Years and not exceeding Three Years old.*—This class only brought out two animals, "Conjuror," a grand animal, taking first honours in his class. "Taurus," a useful bull, took second prize.

CLASS 63. *Bulls above One Year and not exceeding Two Years old.*—"President," 1 year 11 months 3 weeks 1 day, first. "Landlord," 1 year 10 months 3 weeks 6 days, second—two very good animals. "Horace 4th," deservedly placed third.

CLASS 64 did not represent anything of note, but was all through a useful lot of animals.

CLASS 65. *Cows in-Milk.*—Here "Nanette," 4 years 3 months, took first prize, she being a grand massive animal, good in all points, with a very good bull-calf at her side. "Perfection" took second honours.

CLASS 66, for *Heifers not exceeding Three Years old,* was a very good class. "Downton Rose," 2 years 11 months, was placed first; a grand level animal with a meaty table back. "Gaylass 4th," 2 years 10 months 3 weeks 6 days, second; a very grand heifer. "Primrose 4th," 2 years 11 months, third.

CLASS 67. *Heifers above One Year and not exceeding Two Years old.*—In this class "Lady 3rd," a very superior animal, was first. "Antoinette," a moderate animal, second.

CLASS 68—for *Heifer Calves*—brought out four animals. "Pearl 3rd" proved an easy winner, she being a good level heifer. "Juliet" was a good second.

JOHN PRICE.
WILLIAM HOLT.
GEORGE NAPPER.

DEVONS.

Devons, remote from their native home, were select rather than numerous. Lord Falmouth's "Master Molesworth," nearly four years old, was second at Bristol, and second again at Kilburn; he has improved, and now came in first. He is compact, level, and well covered with good flesh, but rather narrow, especially behind. His worthy rival was Mr. Walter Farthing's "Lord Newsham," hitherto first at every Royal and other show where he has been entered, and winner besides of the champion prize for the best Devon Bull at Kilburn. Most judges consider that he has the merit of being on a somewhat larger scale than most Devons. He has a good masculine head, width and depth throughout, and is well covered with good flesh, but droops a little in his hind-quarters. Bulls between two and three years old (Class 70) were headed by Lord Falmouth's very splendid "Sir Michael," 2 years 10 months old, first at Kilburn as a yearling, wonderfully straight, level, and stylish, equally invested with kindly handling flesh, very fine in his bone, probably the most perfect beast in the Cattle classes. If any fault is to be found with him it is perhaps that he is too pretty, and somewhat wants masculine character. Mr. George Turner's "Aqualate" was put second, but with the exception of his chest, he is plain all over, and bare on his chine and back. Mr. W. R. Fryer's "Shamrock," first at the Devon County and at the Worcester Bath and West of England, and only four weeks over age for the yearling class, and ten months younger than his rivals, should, perhaps, have been second. He is a useful well-formed bull, with good flesh, but a little drooping in his hind-quarters. Five animals not being forwarded, no third prize was awarded, occasioning, as in the Hereford classes, the remark that losses at recent Meetings make the Society provokingly careful of their prizes. Of Bulls between one and two years old (Class 71), out of four entries the two which put in an appearance were only of medium merit. Bull-calves (Class 72) were much better than the yearlings, and showed a good deal of character and quality. Mrs. Langdon's "Duke of Flitton 15th" was first: a compact, stylish, well-made-up calf, a little narrow and drooping in his hind-quarters. Mr. Walter Farthing's "Prettyface's Duke" is of larger frame, not quite so well made up,.and a trifle flat on the rib, but looks like growing into a useful animal.

A massive, level, excellent specimen of the Devon, and characterised by the Judges as "almost perfection," is Mrs. Maria Langdon's "Temptress 8th," second in the corresponding class at Kilburn, when Mr. W. Farthing's "Prettyface" won the champion cup, worth 50*l.* "Prettyface 2nd," from the champion matron, level and stylish although she is, and the best three-year-old at Kilburn, does not maintain her mother's pride of place, and both here and at the Bath and West of England, was second to "Temptress 8th." Mr. Fryer's highly commended "Azalea" is compact, level, well covered with good flesh, and quite deserving the third prize.

Amongst Heifers not exceeding three years old (Class 74), Mr. Walter Farthing's "Famous 2nd," as at the Worcester Bath and West of England Show, was first—deep, square, of great substance, a little coarse in her horn, but improved since she stood second as a yearling at Kilburn. Mr. Fryer's two exhibits are of very nice quality, but too small. With Yearling Heifers Mr. Walter Farthing came again first with "Famous 3rd," a wonderfully smart, deep, level, good-shaped one, with a splendid head; first winner at Worcester, and first at Kilburn as a calf. Mr. Fryer's "Fuchsia" was a very good second. The five Heifer Calves made a pretty group. Mr. Fryer's "Daphne" was first—neat, ladylike, and well made up, but a trifle too short. Mr. Farthing was second with "Lady Currypool 2nd," a deep.

well-formed calf, of larger frame, not so well made up. Mr. Skinner's creditable calf, of great substance and good quality, was distinguished by the reserve number.

The Judges made the following commentary:—

The Devons, although so far from their native county, were fairly well represented. In the *Aged Bull Class* there were only two entries, both very superior animals, which gave us some trouble to decide which should take first honours.

Class 70.—The first-prize beast is a splendid animal; a finer specimen of the breed is rarely met with. The second shows good quality and breeding.

Class 71.—A weak class, and does not call for any special remark.

Class 72 contained some promising youngsters. No. 683 took first, and is likely to be heard of at future Shows. No. 684 is a useful calf with great depth of flesh, but is rather flat on the rib.

Class 73 was good, and all three animals exhibited are fine specimens of the breed. No. 686 we think almost perfection.

Class 74 was very weak, and does not require any special remark.

Class 75 contained some useful animals. We had some difficulty to decide between first and second.

Class 76.—A weak class.

William Hole.
George Napper.
John Price.

Sussex.

Sussex cattle claim to be improved and larger Devons, with equal precocity, evenly laid flesh, and providing more meat for the million. The enthusiastic cultivators of this rising breed filled ninety stalls at Kilburn, but a score was a very fair contribution to send so far north as Carlisle. Some of the bulls, although level and kindly feeders, appeared flat in the rib. None were seriously overfed. Messrs. Stanford's first-prize bull (Class 77), nearly four years old, has rare length and shape. Messrs. Heasman's second-prize-winner has good back, loins, and quarters. Undoubtedly the best of the males was Mr. James Stewart Hodgson's two-year-old "Oxford," first in a large class last year at Kilburn, winner of the 25-guinea cup as the best male representative of the breed, and now developed into a well-furnished handsome bull. The second-prize-winner has good head and fore-quarters, but is light behind. Much needed attention is given to milking capabilities. Messrs. Stanford's ten-year-old cow, victorious in many a showyard, with other good points has a great square-set vessel, with teats well apart. Subjoined is the carefully considered Report of the Judges:—

In the Classes for Sussex Cattle the animals shown were a very good lot, but rather short in number. For *Old Bulls* there were only two entries, and both were good representatives of the breed. In the class for *Bulls above Two years and not exceeding three years old* there was one of the best animals of this breed ever brought before the public. He is scarcely two years and ten months old, and does a great deal of credit to his breeder and exhibitor. The other animals in this class were of fair average merit. In the youngest class for Bulls the one placed first was a massive heavy-fleshed animal, with great promise of improvement with age; the others were nice animals.

In CLASS 80 the cow placed first was over ten years old, but still carries a great deal of flesh. She had her bull-calf by her side, which is likely to become a valuable animal.

The first prize in CLASS 81 was awarded to No. 717, which was an exceedingly good animal, the others being of fair average merit.

The Class for *Young Heifers* brought together a very useful lot. The first-prize is an extremely good animal for her age, and shows a great deal of breeding. She comes from the well-known Angmering herd.

GEORGE NAPPER.
WILLIAM HOLE.
JOHN PRICE.

LONGHORNS.

Longhorns increase in number and popularity; a Herdbook records their ancient descent; new breeders in other parts of the country are added to the ranks of their select Midland Counties supporters; separate classes are opened for them at many important shows; 130*l.* offered in prizes at Carlisle called forth 18 entries. Whilst cultivating early maturity, the economical manufacture of beef, and showyard honours, it is to be hoped that the milking capabilities of this old dairy sort will be preserved. For such purposes they are more likely to be of national value than in vainly competing more exclusively as beef-makers with Shorthorns, Herefords, and Polled breeds. If they are to become a robust, hardy, milking breed, the overfeeding of the heifers, animadverted on by the Judges, must be avoided. The most striking Longhorn was Major-General Sir Frederick Fitzwygram's "Prince Victor," one of the biggest and most imposing bulls at Carlisle, with capital carriage, back, loins, and hind-quarters. His half-brother, shown by Mr. Hall, of Derby, was placed second; several of his progeny took prizes in the younger classes. Of the females the best-looking was the Duke of Buckingham's prize two-year-old, the massive symmetrical "Lady Aston." The Judges having given the following detailed Report, further comment is unnecessary:—

The somewhat scanty exhibition of Longhorns, as regards numbers, may probably be accounted for by the great distance of Carlisle from the Midland Counties (the home of the Longhorns): still, there were some excellent specimens of the breed in the several classes.

In CLASS 83, for *Bulls Two Years old and upwards*, the first prize was awarded to a grand massive animal over six years old, which carries his age well; if our memory serves us he occupied the same position in his class at Kilburn last year. The second- and third-prize bulls fairly represented the breed.

In CLASS 84, for *Bulls under Two Years old*, the first prize went to a thick useful animal, giving promise of making a good bull at maturity. His col is not quite what the Judges might have wished. The second prize was awarded to a fairly good yearling.

In Class 85, for *Cows Three Years old and upwards*, there were but three entries, ages varying from four to seven years, shown in good breeding condition, doing much credit to their respective breeders. In this class the Judges considered they were quite justified in recommending a third prize to be given.

In Class 86, for *Heifers under Three Years old*, there were six entries, all exhibited, but being of such different ages (some being seventeen months while others were nearly three years old) it was not easy to arrive at their respective merits. The first prize was awarded to a very level good animal, but rather hard in her touch. The second prize went to a very superior heifer, with good hair and touch. The third-prize heifer is not so level as the second. The reserve number went to a very promising heifer one year and six months old. The Judges remark that the three prize heifers were in their opinion excessively fed for breeding purposes.

J. H. Burbery.
Thomas Bowstead.

Channel Islanders—Jerseys and Guernseys.

Channel Islanders last year made a grand muster of nearly 300 from their Island home and from the Southern English counties where they are chiefly bred: it could not be expected that they would crowd in such numbers to Carlisle. An entry of 56, a larger number than was contributed by any other cattle except Shorthorns, unmistakably demonstrated the popularity of these valuable milkers. Many of the best Island as well as English breeders were represented, and several were sent from adjacent counties. Some of the Kilburn prize-winners were again entered, but it redounds to the credit of Carlisle that new-comers took the chief honours. Fashion has cast her glamour around the Jerseys, and arbitrarily proclaims in favour of silver-grey. To this prejudice in favour of a colour which is often unfortunately associated with delicacy of constitution more important points are sometimes lost sight of. Even the prominence and form of the udder, and the amount of milk yielded, have occasionally received secondary consideration—a fatal error in a breed specially devoted to milk.

From a good class of Aged Jersey Bulls Messrs. Charles A. Barnes and J. P. Marett, whose awards met with universal approval, selected for premier honours Mr. William Arkwright's "Grey of the East," imported from the Island, third last year at Kilburn, very perfect in his shape, style, and handling, his dark-grey skin being freely tinged with yellow, very noticeable on the inside of his ears and down his thighs. Mr. Francis Le Brocq's "Farmer's Glory," the prize yearling at Kilburn, made a good second, smart in his head and horns, level, and of good colour. Another Jersey exhibitor, Mr. John Le Brun, had the third place with a first-class bull which has gained many prizes in the Island. Mr. George Simpson's stylish "Milk Boy," had a high commendation and the reserve card.

Bulls under two years old, Class 88, did not show to so much advantage.

Cows in-Milk or in-Calf, three years old and upwards (Class 89), collected 13 superior animals. First amongst the lot was "Her Majesty," the property of Mr. George Simpson, victorious in many a well-contested competition, with all the style and character of a first-class milker, a graceful head and neck and light fore-quarters, a pliant skin of beautiful fawn, tipped with deep yellow, and a well-placed bountiful udder. Her fellow cow, "Milky," five years old, bred by Mr. Walter Gilbey, the champion Jersey of the London Dairy Show of 1877, is a stylish silver-grey, but wants the splendid milking conformation of her companion. Mr. Simpson had other good cows in the class. Third honours went to Mr. William F. Watson for his silver-grey, commended at Kilburn, second at last year's Dairy Show, possessed of good style and vessel, but rather plain about her head and horns.

Heifers under three years old (Class 90) were a superior collection of 12, Mr. Francis Le Brocq sending three, and Mr. Simpson two, and dividing the prizes amongst their charming stylish heifers, elegant in their markings, and promising rich milking properties.

GUERNSEYS had 14 representatives, several of them direct importations. The three bulls, shapely, level, and of good colour, have already signalised themselves at Royal and other Meetings. The five cows tell of handsome dairy profit. Mr. R. N. G. Baker's "Nancy 2nd" stood first, with plenty of size and a grand udder. Mr. J. James's "Rosebud" came second; smaller, more elegant, and with even more milking capacity. The half-dozen heifers forwarded by Messrs. Baker and James very fairly maintained the reputation of the breed.

The decisions of the Judges met with general approval, and the following is their critical Report:—

We were agreeably surprised to find at an exhibition held so far north such a numerous collection of Channel Island cattle; more especially as eleven of the number may be said to have come from the North of England. The total number of entries was 56, and this fact goes far to prove how much the demand for this useful breed of cattle is increasing. We remember that at the last Meeting of the Society at Carlisle, in 1855, there were no entries of either Jersey or Guernsey cattle.

In CLASS 87, for *Jersey Bulls over Two Years old*, we awarded the first prize to one of the richest animals that ever entered a show-ring, and one equally good in all points. The second was a well-shaped level bull, but not to be compared in richness with the first-prize; its horns were also not quite all that could be desired. The third-prize and the reserved number were good bulls, but the latter was out of condition.

The younger bulls were only moderate; we awarded the first prize to a good-bodied animal with rather a heavy head. The second, No. 748, was a good-headed animal, but rather deficient in his quarters. The third was a nice young bull, but too young for his class.

There were 13 cows came into the ring in Class 89, but with the exception of the prize animals there was scarcely a cow with a good udder. The chief object of most of the breeders appeared to have been to breed for colour, and we here wish strongly to impress upon those who follow this pernicious custom, that however fashionable colour may be, a cow with a misshaped vessel is utterly worthless as a dairy animal.

In Class 90 we selected a very rich heifer, No. 772, for the first prize; and we have no doubt she was far away the best female in the Channel Islands classes. The second-prize was a good heifer, but wanting in richness and with a bad-coloured horn. The third was rich, but rather plain in her quarters.

In the Guernsey Classes there were only three bulls brought before us, and we had no difficulty in awarding the prizes.

The cows were a moderate lot. The second-prize was of excellent quality but deficient in one of her quarters, or we should have placed her first in her class.

In Class 93 the first-prize heifer, No. 795, had calved in September last, was in-milk and said to be due again in about two months, and although a trifle small, was very neat. The second was rich, but rather coarse, and the third very fat, and though two years old she was only just served, and we doubt her being in-calf. The remainder call for no comment.

Charles A. Barnes.
J. P. Marett.

NORFOLK AND SUFFOLK POLLED.

Norfolk and Suffolk Polled, descendants at a remote period of the Polled Galloways, have in recent years been greatly improved. So recently as 1845 they were described in the 'Journal,' vol. v., as "generally of a dark-red colour, without horns, have narrow backs and thin thighs, and are of stunted growth. There may be some decent animals among them, but few will venture to say anything in their favour as a breed, except that the cows give a good quantity of milk." This reproach of unprofitableness has been removed. The rounded carcass is brought nearer the ground, kindly flesh is evenly laid on, the thin shrunk thighs are expanded; as beef-makers the English Polled promise to rival their Scotch congeners. They contributed at Carlisle a score of useful beasts; Messrs. Palmer, Hammond, J. J. Colman, and Alfred Taylor shared the prizes. The bulls displayed good shape and plenty of natural lean flesh. The cows had size and constitution, and, moreover, filled the bucket fairly.

Mr. John Price gives the following commentary on his awards, in making which he was assisted by the Judges of Herefords:—

Class 94. *Bulls Two Years old and upwards.*—"Daveyson 3rd," first—a wonderful good animal, with massive frame, good quality, and very level. "King Charles" took second honours, well deserving of his position. "Stout," third, a very promising young animal.

Class 95. *Bulls not exceeding Two Years old.*—"Daveyson 7th" took first honours—a very nice level animal. The second, "Ben," was good.

Class 96. *Cows in-Calf or in-Milk, Three Years old or upwards.*—"Fanny," 8 years 10 months, took first prize; a very good animal, showing excellent quality and good level outlines. The second, "Flirt," is a very good cow.

Class 97. *Heifers under Three Years old.*—"Silence" took first honours, being a very nice heifer, and does her owner great credit. The second-prize heifer is a very good specimen of the Norfolk breed.

John Price.

Ayrshire.

Ayrshires, although tempted across the Border by prizes amounting to over 100*l.*, made a provokingly limited exhibition of eleven animals, nearly all sent by the Duke of Buccleuch. Surmising that the Duke was to be a large exhibitor, astute Scotch breeders were apparently averse to enter against odds of winning prizes. The Duke's only competitor was Mr. James Duncan, of Benmore, Kilmure, Greenock, who, in charge of a pair of good useful cows, sent a stout sonsie dairywoman. The Duke of Buccleuch at Drumlanrig has about fifty Ayrshires in-milk; for half a century they have been carefully cultivated; for about ten years picked specimens have been sent to the principal Shows; great pains are taken to perpetuate the best milking strains; special attention is given to a capacious milk-vessel, broad and firmly attached to the body behind, extending well forward, with square-placed, shapely teats, 2 inches to 2½ inches apart. Perhaps most breeders sacrifice too much to milk. Some strains want substance and constitution, others are running to unpleasantly light colour, which is said to have the best reputation for milk. At Drumlanrig, cows in their prime, milked twice daily, yield 18 imperial pints at each meal. The heifers, generally kept in poor condition, to favour milk rather than flesh, calve at three years old. Notwithstanding spare diet and physic, occasional losses result from milk-fever, occurring within three days after calving; the risks of which, however, may be diminished by not drying the adult best milking cows, but dripping them daily, or every second day, right up to the time of calving.

The Duke of Buccleuch's four-year-old "Morning Star," white and dark-brown, bred by Mr. W. Hunter, Abington, Lanark, is an admirable type of the breed; with more substance and natural flesh, and a better twist than is usually seen, and carrying himself gaily, as in proud consciousness of never having been beaten. The second bull, "Lord of the Isles," although very useful, lacks the breadth, substance, and imposing style of his rival. The Drumlanrig cows and heifers, several of them home-bred, have the short legs, light forehand, big hind-quarters, and capacious vessel, insisted on by connoisseurs of Ayrshires.

The Judges report as follows :—

In CLASS 98, for *Bulls above Two Years of age*, only two animals were shown, but both were first-class.

In CLASS 99, for *Cows above Three Years old*, there were nine animals brought forward, and in our opinion they were altogether a very fine class, the quality of the exhibits being unusually even.

In CLASS 100, for *Heifers not exceeding Three Years old*, there were only four entries, but all were beautiful specimens of the breed. Rarely have four as good young Ayrshires been seen at any Show on either side of the Border.

WILLIAM BRAKENRIDGE.
ANDREW ALLAN.

POLLED GALLOWAYS.

Polled Galloways, almost within their own stronghold, with 195*l.* handsomely offered in prizes by the Carlisle Local Committee, divided into six classes, made forty-nine entries, and secured exhibits from the well-known herds of the Duke of Buccleuch, Messrs. Morton and Sons, Robert Jardine, M.P., James Cunningham, James Graham, Sir Frederick U. Graham, Bart., and Sir Henry R. Vane, Bart. Competition in many of the classes was close, and the exhibition proved the most successful that has ever been witnessed either in England or Scotland.

About 1850, the breed was threatened with extinction. Anxiety to produce milk led to free crossing with Ayrshires and Shorthorns. Fortunately, Mr. G. Graham, of Riggfoot, Mr. Charles Stewart, Hillside, Lockerby, and other admirers of the sort, made a stand, got together some good ones, by-and-bye inaugurated bull-sales at Lockerby and Castle Douglas; the Galloway Agricultural Society was started, and shortly the Galloway Club; a Herdbook has also been established. The South Country Polled have again extended throughout the south-western Scottish counties, and into the North of England. The best bulls realise from 20 to 70 guineas each, and picked cows nearly twice as much. The modern Galloways have been brought somewhat lower on the leg, have more quality and kindly handling. The abundant hair necessary for their rainy habitat is not so hard and wiry; they take on "the last dip" more early and kindly than heretofore. Although superior graziers, they do not, however, stand high for dairy purposes.

The well-considered detailed Report of the Judges prevents the need of any comments of mine upon the awards :—

The North of England and the South of Scotland having from time immemorial been the native home of this fine old breed of beef-producing animals, it was very gratifying to find such a good representation of Galloway cattle in respect of both numbers and quality. Indeed, rarely if ever has there been such a collection of really first-rate Galloways at any exhibition on either side of the Border. While the exhibits were brought out in excellent form, they showed no indication of being unduly pampered, but were exhibited in a suitable condition for breeding cattle.

The six *Aged Bulls*, in CLASS 101, submitted to our inspection, were a highly meritorious level lot. The first-prize animal, No. 832, is a massive bull of great substance, equally fleshed, and of good quality. He is a good representative of the characteristic features of the breed. No. 835, placed second, is a little undersized, but he possesses many superior qualities. The bull, No. 837, to which the third ticket was awarded, is a well-proportioned three-year-old, whose brisket might be slightly heavier with advantage; and the reserve bull, No. 836, is well-fleshed, and has a mellow skin, though his neck is a little short.

CLASS 102, for *Bulls above Two and not exceeding Three Years of age*, comprised seven capital animals. No. 841, placed first, is a first-rate beast in every respect, with the single exception that his hind-quarters are a little lighter than is desirable. The second-prize bull, No. 842, has many superior points, having well-fleshed grand quarters, his chief defect being a slight shortness of neck. The bull to which the third ticket was assigned appeared in excellent bloom, but we would have liked him better had he been a little bigger.

The half-dozen *Yearlings* submitted to our judgment in CLASS 103 appeared to us to be extremely full of promise. No. 846, placed first, is a square, level, massive youngster, and is possessed of true Galloway characteristics. A stylish well-developed bull, with a gay head, No. 847, was selected for the second prize; while the third ticket was awarded to No. 848, a bull good all over, and his quality first-rate.

The three classes for females of the Galloway breed contained a large number of animals of surpassing excellence. There were a dozen entries in CLASS 104, for *Cows*, and more than one-half of these were of such first-class merit that the Judges would have had no grudge in awarding any one of them a first-prize ticket. It is hopeful for the quality of the breed in future years that the breeders have not only superior bulls to work with, but also such very meritorious animals on the female side. The four cows placed are even in general merit in an unusual degree, though they differ somewhat from each other in their individual characteristics.

CLASS 105, for *Heifers in-Calf or in-Milk, above Two and not exceeding Three Years old*, was not numerous, but the quality of the majority of them has seldom been surpassed by animals of the age. The first-prize beast, No. 869, is in almost every respect a model specimen. Her proportions are nearly quite true, and her quality is unexceptionable. Though placed behind her, Nos. 866, 867, and 868 are also first-rate heifers.

A dozen *Yearling Heifers* were entered in CLASS 106, and a very creditable appearance they made in the ring. No. 879, to which the first prize was assigned, is in all respects a favourable specimen of a young Galloway, her quality being excellent, and her head first-rate. No. 880, placed second, has more substance than her successful rival, but she is not so good in other points, and especially at the tail-root. The third-prize heifer, No. 876, has superior quarters, and seems full of promise, but her fore-ribs are not quite so well sprung out as could be wished. Several of the remaining exhibits in this class were deserving of commendation.

ISAAC WALTON.
M. CLARK.

POLLED ANGUS OR ABERDEEN.

Polled Angus or Aberdeen have long been familiar to frequenters of the Southern winter fat Shows, and contribute largely to the prime beef of the Metropolitan Market. Continued selection has moulded a model frame, which systematic liberal feeding rapidly and evenly clothes with a great weight of prime beef. The Judges present so full a statement of their favourite breed, that I need only remark that the twenty Polled Angus exhibited were of high and uniform merit. "Prince Albert of Baads," the property of Mr. Robert Anderson, bred by a small farmer, Mr. George Reid, Peterculter, Aberdeenshire, has been victorious wherever shown, and was first here. He is a very perfect type of a big, deep, massive beef-carrier, withal level and of good quality; his only fault being undue prominence and openness of his shoulders. The Marquis of Huntly's four-year-old, "Monarch," first last year at the Highland and Agricultural Society's Show, and second at Kilburn, took the latter position here. He is level and compact, has neater shoulders than his rival, but lacks his size and grandeur. The Earl of Strathmore's "Bombastes," first yearling at Kilburn, came third; has a grand back and loin, but a plain head. Mr. G. Hamilton's thick compact three-year-old was placed fourth.

From six good yearling bulls, Mr. H. D. Adamson's "Knight of the Shire" was the first pick. He comes from a 100-guinea purchase of the "Premier Pride" tribe at Mr. McCombie's 1875 sale; is good along his back and crops; has a nice head, but is a little high at his tail. The Earl of Airlie's "Ericson," from a 100-guinea Erica cow, after a 200-guinea "Pride" bull, has great substance and style, and came in second. Mr. John Hannay's "Young Viscount" was third, and, although shapely and substantial, has a plain, sour head. Mr. G. Wilkin's reserve bull is strong, but wants quality. The Earl of Strathmore's yearling is more compact and stylish.

Three well-known prize-winners, with nicely-balanced merits, competed in the Cow Class (No. 109), and held the Judges long in anxious deliberation, which resulted in awarding the first place to Mr. H. D. Adamson's "Sibyl 2nd," bred by the late W. McCombie; first at Alford and Aberdeen as a yearling, one of the renowned Paris group as a two-year-old, second at the Edinburgh Highland Society's Show in 1877, and third last year at Perth. She has wonderful wealth of flesh, is in very high condition, fit for any Christmas ring, has a stylish head, ample girth and rib, meets the observer well, but is light in her hind-quarters and thighs. Smarter and more stylish, more evenly-balanced, moving with greater freedom, as might be expected from her moderate condition, was Mr. George Reid's "Isla," the preferred of the Dumfries Highland Show of 1878. The third, a lengthy cow, "Sunshine 2nd," in moderate condition and milking freely, was contributed by Mr. W. M. Skinner. At three consecutive Highland Shows she was first as a yearling and two-year, but training to milk rather than beef, has dropped as a cow to the third place.

Heifers under three years old contributed one of the best females on the ground, the Earl of Airlie's "Pavilion;" charming in her outlines, wealthy in flesh, captivating in style. Mr. Adamson's "Pride of Aberdeen 19th" followed; good along her back, nice in her flesh, but not so well developed along the floor of her chest. Mr. John Hannay was third with a useful stylish heifer, grand in her forehand, but somewhat wanting in girth. The Earl of Strathmore's yearling, shown to disadvantage amongst older competitors, well deserved her commendation.

The Judges furnished the following enthusiastic remarks on the merits of the Angus breed, and some particulars as to their awards:—

Exhibitors of the beautiful "Angus Doddie"—for the production of first-class beef so clearly ahead of all other breeds of cattle—cannot be too highly complimented on the fine display they have made. "Such fine cattle those North-country black-polls are," was a common remark from agriculturists who had never previously had an opportunity of witnessing such a collection of the handsome Polled Angus. And no wonder it is that the "Angus Doddies" are objects of general admiration, as indeed they were at Carlisle, alike to interested and disinterested lookers-on. Those acquainted with the characteristics of the breed know that in symmetry of form, quality of flesh, and early maturity, the sonsie Angus yield to no other breed; while, with the general uninformed non-agricultural public, they seem to be first favourites on account of their glossy black skins, and the gracefulness and beauty of their forms.

Breeders of this valuable class of stock have to regret that during the past year their ranks have been thinned by the death of two of the oldest and most prominent cultivators of the breed. To these two gentlemen, Mr. William Fullerton, of Mains of Ardestie, Forfarshire, and Mr. William McCombie, of Tillyfour, Aberdeenshire, breeders of Polled Angus cattle owe much. Mr. Fullerton, who was contemporary with the early Forfarshire breeders and improvers who flourished in the first and second quarters of this century, did a great deal for the breed in the earlier stages of its popularity; and a great number of the best polled cattle in the North of Scotland trace to his herd. By building upon the foundation which Mr. Fullerton had laid, and by resorting to the parent Keillor herd in Angusshire for his bulls, the late Mr. McCombie raised his herd at Tillyfour to a high state of perfection. As is well known, he gained the "Grand Prix" at the Paris Exhibition in 1878, with a group from his herd, and during his lifetime he did a great deal to bring this breed prominently forward by exhibiting animals far and wide, and "conquering in a hundred fields." By treading, as it were, in the footsteps of his exemplar, Mr. Hugh Watson—the presiding genius of the Angus cattle at their headquarters at Keillor, near Coupar Angus—Mr. McCombie not only effected improvement but uniformity in his herd, and the specimens which he showed from it were year by year getting nearer the desired type of the Keillor Doddie as cultivated by Mr. Watson.

Although it is only within recent years that Angus cattle have got so far in the ascendant as to have separate classes allotted to them at the Royal, it is more than half-a-century since this breed was described by a competent authority, as being "the pride of the Forfarshire aristocracy, and the admiration of Europe." Even at that early date, some of the Forfarshire polled herds had attained to as high a state of perfection as any of the numerous herds which now extend far beyond their original Angusshire, and are scattered over Scotland, England, and Ireland. The general stock of Angus cattle, however, of which the animals here exhibited may be taken as representative, are progressively improving, and very great care is now being bestowed on the cultivation of the breed; as exhibitions like the present sufficiently testify.

As to the classes:—

Aged Bulls.—Amongst the four exhibited (all excellent animals) the first and second were of rare merit, and cannot be beaten in any showyard, being both first-prize animals at the Highland Society's Meetings and other Shows.

Young Bulls were a very meritorious lot, more especially the first-prize animal, which is a yearling of great merit and excellent breeding.

The *Cow Class* was small in numbers, but we never followed three better animals than those placed first, second, and third. Either would have made a superior first in any showyard. They were the best representatives of the breed shown at Carlisle.

Heifers were a good class: the first and second are very fine animals, as also the whole class; although a commended heifer was perhaps a little overfed for a breeding animal. Having difficulty in judging this class, on account of two-year-olds and yearlings being shown together, we would suggest and hope that the Royal Agricultural Society of England will in future give separate prizes for two-year-olds and yearlings, both in the Bull and Heifer classes.

THOMAS FERGUSON.
WM. WALKER.

DAIRY COWS.

The indefatigable Local Committee vainly endeavoured to attract a good show of Dairy Cows by offering prizes to the value of 50*l.* Only six entries responded to this invitation, more than half of them from a distance, leading to the erroneous inference that dairying is an unknown art in Cumberland. An irregularity in the entry as to the colour of one of his cows set aside Mr. Thomas Robinson Lynas' pair of useful Yorkshire Shorthorns, and 20*l.* was awarded to the only other competitor, Mr. James Watts, for his two little Kerries. For single Cows of Any Breed or cross, in-milk, from the four useful entries, all of Shorthorn type, Lord Fitzhardinge's six-year-old was the choice. Calved March 27th, she is said, when quietly at home, to give four gallons night and morning. Mr. William Sawers' second-prize cow gave nearly as much as the first, but would scarcely make such a good carcass of beef when her dairy duties are ended. Mr. Stratton's "Maiden," useful in the dairy, has also the quality which would ensure a good butchers' price. It would be instructive, and a useful guide to the Judges, if the cows in these dairy classes, when first they enter the Showyard, were milked dry under supervision, and their yield for several subsequent milkings was then carefully measured and recorded. The Judges' award is subjoined:—

In CLASSES 111 and 112 the Judges were much disappointed to find so few entries for prizes given to encourage the production of milk, considering that Carlisle is the centre of a very large and very important dairy district.

In CLASS 111 only two pairs of cows were exhibited, a pair of Shorthorns and a pair of pretty Kerries; the Shorthorns were disqualified from incorrect entry, the prize going to the Kerries.

In CLASS 112 only three cows were exhibited, two of which, showing more than ordinary milking qualities, were awarded prizes. The reserve number, a good cow, gave more indication of making flesh.

J. H. BURBERY.
THOMAS BOWSTEAD.

SHEEP.

Sheep contributed 448 entries, in 40 classes. The entries at Kilburn were 760, at Bristol 396, at Liverpool 410. All the important breeds were fairly represented, and the agriculturist must be capricious or his locality peculiar who could not find amongst these samples of some fifteen sorts animals likely to suit his taste or situation, and pay for his good management. Shropshires and Southdowns made the largest entries, and contained, moreover, many excellent sheep. In many classes where competition was restricted, as amongst Oxfords and Hampshires, a very high standard of usefulness and excellence was also reached. Classes for rams, as formerly, filled much better than those for ewes, and notwithstanding the admitted difficulty of producing superior male animals, all breeds furnished better rams than ewes. Flockmasters are perhaps naturally averse to sacrifice their best females even for showyard honours. Amongst breeds peculiar to the district, Border Leicesters made an admirable exhibition, combining the several advantages of size, constitution, and early maturity, with good mutton and wool. Throughout the North of England and Scotland, they are deservedly prized for crossing all the commoner sorts. Cheviots, although a very small muster, brought out some capital sheep, from two of the oldest and best Border flocks. The mountain sheep, retaining their essential hardiness, are becoming more compact and shapely, and are clothed with a better fleece. The black-spotted goat-like Herdwicks, and the long-legged somewhat Cheviot-like Lonks, are still susceptible of considerable improvement.

LEICESTERS are unrivalled in their uniformity of type. Long and careful breeding of the best flocks gives impressive power. Throughout the north midland and northern counties no breed so successfully secures early maturity and is more largely used for crossing. The Shearling Rams (Class 113) turned out 23 competitors—Mr. Teasdale H. Hutchinson, who has had a large share of the honours at most recent Royals, being first and third; Mr. Hebden Borton, second; Mr. Ernest F. Jordan, commended and reserve. The prizes for the Aged Rams went in exactly the same order. Three pens containing Five Shearling Ewes of the same flock were placed as follows:—Mr. Willian Brown, first; Mr. E. F. Jordan, second; and Mr. George Turner, junior, third. The Judges, who also acted in the Lincoln Classes, attached the following comments to their awards:—

CLASS 113. *Shearling Rams.*—A very good class, but the first-prize sheep is very superior to the others, being a true type of a Leicester, with fine character, good skin, and beautiful mutton.

CLASS 114. *Aged Rams.*—Again a very good class; the first-prize sheep being very similar in type and character to the one occupying the same position in the younger class.

CLASS 115. *Shearling Ewes.*—A small class, but full of merit. The prize pen are of great size, with capital backs and good skins. The second-prize pen are very good in character and match well, but are smaller, and do not handle so well as the first-prize pen. The third are a pretty pen, but smaller than the others, and somewhat delicate.

Taking the Leicesters as a whole we think that the prize sheep fully maintain the standard of previous years, but in some of the exhibits there are signs of out-crossing, which has not been attended with success.

GEORGE H. SANDAY.
JOHN P. CLARK.

BORDER LEICESTERS for thirty years have been growing in popularity throughout the South of Scotland and North of England. They are of larger frame than the blue-faced English Leicesters, which some ascribe to a dash of Lincoln or Cotswold, are more hardy, and in the northern climate maintain their type more readily. Some of the flocks seem to be losing wool. From the south-country sales the rams are every autumn widely distributed, at prices varying from 3 to 30 guineas. "Ralph," the sire of Mr. A. Smith's grand old sheep, cost 120 guineas. With 40 pens of those big useful sheep the chief breeders were well represented. The Hon. Robert Baillie-Hamilton, Messrs. Andrew Smith, Robert Watson, William Wilson, and Samuel Jack divided the best prizes. As in most other divisions of sheep, the rams made a better show than the ewes, which were poor and not well matched. Few breeders are disposed to feed and bring out their best ewes; and if retrenchments are to be made in this department of the prize list, premiums for ewes may be materially reduced. The Judges gave the following digest of their opinion of the exhibition:—

Class 116. *Shearling Rams.*—A very good lot. The first-prize sheep is lengthy, with good wool, fine head, and good style; the second and third are smaller, but excellent types of the breed. Some sheep much above the average usually shown were amongst the unplaced.

Class 117. *Aged Rams.*—Very good. The first sheep possesses great substance and style, although a little deficient of wool. The second sheep has better wool, but is otherwise inferior to the first. Some of the others were fairly good.

Class 118. *Gimmers*—As a class were not equal to the rams.

George Torrance.
William Grieve.

Cotswolds contributed twenty-five big, imposing, stylish sheep, with white curly coats and wavy top-knots, all white-faced, and the pick of four crack flocks. Mr. Robert Jacobs, of Signett Hill, Burford, Oxon, a comparatively new exhibitor, eclipsed his competitors with a pair of grand Shearlings, with shapely outline and good skins. Mr. Thomas Brown, of Marham Hill, Downham Market, Norfolk, had the third prize and two high commendations, testifying that those big useful sheep can be successfully transferred from their original habitat on the limestone hills of Oxfordshire and Gloucestershire. Mr. Russell Swanwick, of the Royal Agricultural College Farm, Cirencester, won with his grand two-shear sheep, Mr. Brown being second and highly commended. The two pens of evenly assorted Ewes came from Messrs. Gillett, of Killkenny Farm, Faringdon. The Judges furnished the following concise Report:

Class 119. *Shearling Rams.*—This was a good class throughout. The prize-winners were specially good specimens of the breed, and we commended the whole class.

Class 120. *Rams of any other age.*—This also was a good class, No. 1021 being a sheep of more than ordinary merit.

Class 121. *Pen of Five Shearling Ewes of the same flock.*—There were only two entries in this class.

James Selmes.
William Thos. Garne.

Lincolns were comprised in 36 pens, of which several were absent. Although more flocks were represented than amongst some other breeds, the standard of merit was not so high as it has been at some former Shows. Several of the sheep were deficient in size and in wool; some partook of Leicester points. Mr. Henry Smith, of The Grove, Cropwell Butler, Nottingham, monopolised the whole of the prizes in both classes for Rams, with the single exception of the third for older sheep, which went to a local breeder, Mr. W. Savage, of Hanging Bank, Penrith. Mr. John Pears, of Mere, Lincoln, and Mr. John Byron, of Kirkby Green, Sleaford, shared the honours for Ewes, to which the Judges thus award high praise:—

Class 122. *Shearling Rams.*—The first-prize shearling, as in the Leicesters was much before the others in merit. The class, as a whole, was numerous, but, with the exception of the first-prize sheep, was very much below the average of previous years.

Aged Rams.—The first-prize, a two-shear sheep of great size and with plenty of wool, is a good type of a Lincoln. The second-prize is a beautiful sheep, but with a little too much of the Leicester character.

Shearling Ewes.—This was certainly the best class that came under our notice. The first-prize pen were of large size, good symmetry, and had plenty of wool. The second and third pens were not quite so large, or so nice in their skins; but still were remarkably good, and above the average usually shown.

Geo. H. Sanday.
John P. Clark.

Oxfordshire Downs increase in popularity. Originally a cross between the Cotswold and Southdown, in the hands of many careful breeders they have acquired usefulness and fixity of type. Their supporters claim for them the size of the Cotswold and Lincoln, with the lean flesh and dark selling markings of the Down, a hardy constitution, and aptitude for crossing and improving almost any other sheep. Lord Lonsdale has a small flock at the Windsor of the North; another is also established near Penrith. At the autumn ram sales Germans and Americans are extensive purchasers. Competition was restricted to eleven pens, six contributed by Mr. John Treadwell, of Upper Winchendon, Aylesbury, who monopolised all the prizes for rams, as he did last year at Kilburn, and as he has generally done lately at the Bath and West of England Shows. In such times of agricultural depression it is reassuring to find some guiding principle which shapes a successful result in farming. Many of Mr. Treadwell's winning sheep for three generations come from Royal winners. He declares—"If you begin with good ones and manage them rightly there is not much doubt as to results." Judiciously managed, their training for exhibition has not interfered with soundness of constitution. Satiated with public honours, Mr. Treadwell declares his intention to retire from showing. The Judges made the following comments on the several classes and on their awards:—

Class 125. *Shearling Rams.*—This class was below the average in point of numbers, and scarcely equal to the usual standard of excellence attained by this useful breed of sheep. No. 1070, a good, deep, heavy-fleshed sheep, with masculine head, lacked quality of wool, or would have held a position amongst the prize-winners.

Class 126. *Rams of any other age.*—This was a useful class, but, there being only three entries, a third prize was not awarded.

Class 127. *Shearling Ewes.*—Mr. F. Street was the only exhibitor, with a pen of good heavy-fleshed ewes.

In concluding our Report we regret that the competition amongst this ncreasingly popular breed of sheep was not stronger in the several classes; but perhaps the paucity of numbers may be accounted for by the distance from the districts in which they are usually kept.

W. Parsons.
W. D. Little.

SOUTHDOWNS made a good entry of 52 pens, contributed from the famous flocks of His Royal Highness the Prince of Wales, the Duke of Richmond, Lord Walsingham, Sir Nicholas W. Throckmorton, Bart., Messrs. W. Rigden, Hugh Gorringe, and J. J. Colman, M.P., all of whom, in close competition, received prizes. No breed shows so much uniformity of character. There seems of late years a wise disposition to some increase of size. The Shearling Rams, although mustering 24 pens, did not exhibit so much uniformity or quality as the older sheep. The Duke of Richmond, who for so many years was in the front rank at all Shows, for some time has been less successful, but here came forward again in all his old form, and in the Aged Class, amongst nearly a score of very superior entries, stood first with a beautiful two-year-old sheep, as near perfection as may be, and signalised by the Judges as being "one of the best sheep in the yard." The Ewes were not so remarkable. Lord Walsingham's first-prize pen included four very good and stylish, and one which did not match; while in Mr. Colman's second pen, of undeniable quality, an indifferent one had also to be introduced—so difficult is it, even in a large good flock, to obtain many individuals which reach the highest standard of excellence. The Judges thus briefly summarise the results of their examination:—

CLASS 128. *Shearling Rams.*—A strong class as to numbers, but deficient in quality and wool.

CLASS 129. *Rams of any age.*—An unusually good class, showing much breed and quality, the first-prize sheep being one of the best sheep in the yard.

CLASS 130. *Shearling Ewes.*—A small class. The first-prize pen were large useful ewes, but somewhat deficient in quality, and not so matchy as we have seen from Merton.

GEORGE JONAS.
HUGH PENFOLD.

SHROPSHIRES, although one of the most recently established breeds, already takes a high place in public estimation. Many breeders have shown great skill and judgment in consolidating and harmonising good points, in securing, and, what is more difficult, in perpetuating, size, style, colour, and quality of wool. Their successes are patent in many Showyards; no breed has been so numerously represented at recent Royals. Hundreds of rams, at remunerative prices, are sold every autumn at Shrewsbury, Birmingham, and other marts, for use amongst pure-bred flocks and for crossing. With a class of 56 useful Shearlings the Judges had an arduous task. It is high testimony to the uniform excellence of a class when it is officially recorded that "there is little to choose between the three first-prize animals;" when regrets are expressed that "a fourth prize was not at their disposal;" and when it is stated that "many deserving animals were unrewarded." Mr. Minton's first-prize sheep is stylish, of superior quality, and has good natural flesh. Mrs. Barr's second award shows more breeding, a better and darker head, and stronger back and loin. Mr. Minton's third shearling was more upstanding, but appeared to disadvantage from a cold. The older sheep were also superior, Mrs. Barr, Mr. R. Thomas, and Mr. J. L. Naper having the prizes. The Ewes, in 15 pens, were also capitally represented: Mr. George Graham's compact shapely lot came first; Mr. J. E. Farmer's more stylish, darker-faced, well-matched, second; Mr. Joseph Beach's bigger, heavy-fleshed, and good-woolled, third. Several level useful pens were rewarded with honourable mention.

The whole of the classes received well-deserved praise in the appended Report of the Judges:—

CLASS 131—*Shearling Rams*—contained an entry of 56, which generally presented a very uniform appearance. There was little to choose between the three prize-takers, which were good, useful, upstanding sheep, of good character and wool, and were admirable representatives of this useful and profitable breed. The Judges regretted they had not a fourth prize at their disposal, as many deserving animals were unrewarded.

CLASS 132—*Ram of any other age*—with 19 entries, possessed great merit; and, where so many really good animals presented themselves, it was difficult to decide upon their respective merits.

CLASS 133—*Pen of Five Shearling Ewes of the same flock*—with 15 entries, was a grand class, and it would be difficult to find in any breed more meritorious animals than the three first winning pens contained. We think the Shropshire sheep-breeders may be congratulated upon the admirable display their breed showed, and upon the great strides they have made in public estimation.

CHARLES R. KEELING.
THOS. MANSELL.

HAMPSHIRES are long, upstanding, hardy sheep, seldom feeding quite so quickly as some other improved sorts, but with plenty of lean meat, and with dark head and legs, which secure them a ready sale. By selection, and by an occasional remote cross, usually with Southdown, they are being advantageously lowered on the leg, rendered more compact, and thickened in the neck. Dropped early, many ram-lambs are used in the first year. Scores are despatched to the Midland and Eastern counties, to produce the black-faced mutton so much in request by West-end customers. The Judges, Mr. George Jonas and Mr. Hugh Penfold, who adjudicated in the Southdowns, briefly recorded "that the Hampshires were very good in all the classes, but were only represented by a few entries from one or two of the best breeders." Although they were generally good, the entries did not come up to the high standard attained at the Kilburn International by Mr. Alfred Morrison's splendid two-shear ram, or by the great, good, well-matched first and second pens of ewes shown by Mr. James Read. The prizes went to Mr. Alfred Morrison, Mr. F. R. Moore, Mr. Henry Lambert, and Mr. William Newton.

CHEVIOTS, although the sheep most extensively bred throughout Scotland, made up only thirteen pens. Some misconception regarding the date of shearing appears to have narrowed competition, and left the friendly contest between two well-known breeders—Mr. Thomas Elliot, of Hindhope, Jedburgh, and Mr. John Robson, Birness, Otterburn. These rival flock-masters on the two sides of the Border each count up some 5000 sheep; they sell annually, chiefly in August, September, and October, about 2000 wethers, two to three years old, reaching 16 to 18 lbs. per quarter; the clip varies from 4 to 5 lbs. per head. Gimmers and Dinmonts have frequently been sent to colonial flock-masters, and especially to New Zealand. Attention is particularly bestowed on constitution and wool, for at the high altitude and in the exposed situations at which these handsome, hardy, Roman-nosed sheep are often kept, delicacy, concurring with sparseness of wool, would be fatal. Mr. Elliot's prize rams are level good sheep, and his two-year-old is a very superior specimen, with good size and great style. Such sheep are much required to improve the girth, loin, and wool of the ordinary rough Cheviots still seen in some districts. The Judges, briefly recording their opinion of the exhibition, thus remarked:—

> CLASSES 137, 138 and 139, although few in numbers, were first-rate in quality, especially the ram in the *Aged Class*, which had both style and quality. The first-prize pen of *Gimmers* was also of high merit; their strong family resemblance was the admiration of all who saw them.
>
> WILLIAM GRIEVE.
> GEORGE TORRANCE.

BLACK-FACED MOUNTAIN SHEEP, from the Scotch, Cumberland and Westmoreland hills, made a good show of bold, hardy, stylish sheep, with grand imposing horns, and frequently with mottled black faces. Like other sorts they are being moulded to greater usefulness. Whilst retaining the hardiness so essential for existence on their upland exposed ranges, and their capacity to subsist on heather moss and coarse herbage which a Leicester or Southdown would not touch, selection has rendered them more shapely, hair or camps have given place to wool. Many flocks now average a very fair fleece of 5 lbs. A thick fleece, a good back, and clean, flat, black-and-white legs are regarded as the chief evidences of constitution. Between Scotch and English breeders there is evidently some small jealousy; each maintain their own sort to be superior, especially in hardiness. The Scotch breeders, who certainly were in greater force, managed, however, to bear off the bulk of the prizes, and Westmoreland farmers admit that an occasional dip into the Northern blood has helped many of the Fell flocks.

Some such improvement is still sadly wanted amongst the Herdwicks, most of which in rough wildness have to be secured by a chain to their pens. These hardy mountaineers live on the fells, 1500 to 2000 feet above the sea-level, from the end of April to September; they clip in July, 3 to 4 lbs. of wool, still mixed with a large amount of camps; and at three to five years old produce nice small mutton. A comprehensive Report of the Black-faced Mountain Sheep, the Herdwicks, and the Lonks, was thus given by the Judges:—

We congratulate the Society on the great improvement of the sheep exhibited, and also on the increase of entries compared with former years. With regard to Class 140, of *Shearling Black-faced Rams*, the first prize we gave to a nice compact sheep, with good quarters and remarkably good wool, but perhaps a little undersized; and the others which obtained honours fully deserved them.

CLASS 141. *Ram of any other age.*—With regard to this class we are all of opinion that the prize animals were good specimens of the breed.

CLASS 142. *Pen of Five Shearling Ewes.*—The first-prize ewes were not so strong in bone as the second; but the quality and nice breeding-points of the former impelled us to give them the prize.

CLASS 143. *Herdwick Shearling Ram.*—The Royal being this year held in their native county, there was a good show of Herdwicks, and it is probable that the entry would have been still larger had the Show been a little later in the year, as pure-bred Fell sheep never look well in July, their natural clipping-time, but are in their bloom in September and October. In this class there were fifteen entries, and we arrived at our decision with some little difficulty.

CLASS 144. *Ram of any other age.*—This class was one of great merit, as was conclusively shown by the quality of the sheep to which we gave the reserved number.

CLASS 145. *Pen of Five Shearling Ewes.*—The whole of this class were of great excellence.

CLASS 146. *Pen of Five Ewes with their Lambs.*—This prize, which was offered by Lord Leconfield, brought together three pens of ewes and lambs. The first-prize were big sheep and of good quality. The pen which we highly commended likewise showed good breeding.

CLASSES 147, 148, 149. *Lonk Sheep.*—We feel almost obliged to couple these classes together, owing to the paucity of entries, and regret very much that such noble hardy sheep were not more numerously represented. The merits of those exhibited were all that could be desired.

J. INGLEBY.
JAMES ARCHIBALD.
HUGH P. HOLME.

Concluding the sheep classes comes a somewhat miscellaneous group of Kentish, Romney Marsh, Devon, and other Long-woolled breeds, containing several pens of useful Wensleydale Longwools, sent by Mr. John Willis, jun., of Carperby, Bedale, and some well-grown Devon Longwools, preferred by the Judges, and forwarded by Messrs. William and George Bird, of Volis, Kingston, Taunton, concerning which the Judges thus briefly write:—

CLASSES 150, 151.—Both these classes were short of entries, but the prize-winners were good specimens of their breed.

CLASS 152.—Only one entry.

JAMES SELMES.
WILLIAM THOS. GARNE.

PIGS.

Artificial treatment, confinement, and forcing feeding, intensified by showyard competition, render the exhibition-pig a machine for the manufacture of lard rather than of profitable bacon or pork. Lard, instead of being from 18 to 20 per cent. of the carcass, is enormously increased; the fat, indeed, is as ten to one of the lean; the offal has been curiously and wonderfully reduced. In their fancy form, over-burdened with fat, many show-animals run risk of being improved out of existence. Their reproductive powers are impaired; the Judges remark, "scarcely any of the sows have litters of pigs," and progeny, when obtained from such over-fed animals, are usually few in number, small, weakly, and difficult to rear. It cannot be profitable to breed pigs whose heads, brains, and even mouths are dwarfed, whose legs with difficulty carry them, and who have neither the capacity nor the power to forage for food. From inordinate obesity the small breeds suffer most, constitution and hair are lost, symmetry is impaired, the fore-quarters become more developed than the hind. Judges of pigs at the great shows have need to make a stand against such artificial treatment and excessive feeding and tendency to monstrosity, and, whilst insisting on early maturity and fatting capacity, give due regard to constitution and general usefulness.

Mr. J. D. Dent, the Steward of Pigs, having been good enough to contribute the following instructive account of this department, further remarks of mine are unnecessary.

It was at Worcester, in the year 1863, that I first made acquaintance with the pigs exhibited in the Royal Agricultural Society's Showyard, and commenced my duties as a Steward of Live Stock. During the seventeen years which have passed away we have had two visitations of cattle plague, and a series of seasons almost unexampled in their severity; but the Royal Show still holds its own, and though death has taken from amongst us many of the friends I made in those pleasant times, I still find some of my old associates in harness, and familiar faces greet me amongst the herdsmen and shepherds. There have been great improvements; not a single pig was disqualified as being incorrectly described in respect of age, and the civility of the exhibitors and their men, even though they saw nearly all the prizes fall to one fortunate breeder, formed a gratifying contrast to the rowdy manners prevalent among some of the pig-fanciers of 1863. I was fortunate enough to have the help of three very able Judges, at the head of whom was our veteran friend Mr. Gibbons, and I am able to incorporate in this Report very much information derived from their experience. They authorise me to say that they consider the show of pigs generally most excellent; in fact, as good as ever was seen in the Royal Yard.

Cumberland bacon has a great reputation, but there were comparatively few exhibitors of pigs from the county, and nine-tenths of the prizes for White Pigs went into Lancashire, thanks to the wonderful exhibits of Lord Ellesmere.

The White Pigs are divided into two distinct breeds, Large and Small; and a third series, of four classes, called "Other Breeds not qualified to compete in any of the preceding Classes." Although there were many pigs of unexceptionable merit in these classes, and though the Judges were specially struck with the excellence of some of the animals, yet I have their authority to confirm my own opinion that nearly all these animals presented more or less the characteristics either of the Large or Small breeds, and might have been exhibited in the classes devoted to those breeds, or else they were crosses between Large and Small breeds, and, as such, as little likely to develop their own characteristics as sheep produced by crossing a black-faced ram with a white-faced ewe. The pigs in themselves were excellent, but if our prizes are to be given for distinctive breeds capable of reproducing their own excellence, I question whether it be wise to give prizes for the "Other Breeds."

Going round with Messrs. Gibbons, S. Walker, and Edwards, they noticed as very good, Nos. 1349 and 1347, two old boars of the Large breed, exhibited respectively by Lord Ellesmere and Mr. Sanders Spencer.

In the next class, for Three Breeding Pigs of the same litter, the Earl of Ellesmere and Mr. R. Tommas exhibited very excellent even pens, but some of the other pens were unevenly matched.

In the next class, for Breeding Sows of any age, were some very grand sows. The whole class was commended, as presenting fine specimens of the Large breed. I suppose that sows with litters cannot well compete with those not having litters of pigs, as in this class three sows having good litters were passed over in favour of those which were in-pig; and the same remark is applicable to all the classes exhibited.

The Small White Pigs were as good as the Large, and again Lord Ellesmere was to the front, pressed at times very closely by Mr. Sanders Spencer. The whole of Class 158 was commended, and the first- and second-prize animals were very good, and uniform in character. The Young Sows in Class 159 were also good, but some pens were spoiled by want of uniformity in size and character. The next class, 160, that for Older Sows of the Small Breed, was perhaps, as a class, the best in the Show, and the Judges commended the whole. In this class not a single sow had a litter of pigs.

After these good specimens of White Pigs, it was disappointing to find the Small Black Breed so badly represented. In one class no prize was given; in another the prize might not unreasonably have been withheld; and in the four classes, competing for 60*l.*, only 13 entries were present, and but one pig, No. 1417, was considered by the Judges to be a really good one. Is it worth while offering prizes for animals which have no connection with the district where the Show is held? I know this is a debatable question; but there are at times, as it seems to me, very good reasons to omit certain distant breeds, and devote the money to prizes for animals peculiar to the district where the Show is held.

The four classes of Berkshire Pigs presented a more creditable appearance than the Small Blacks, as in each of them the Judges remarked on some good pigs, although others were scarcely worthy of a Royal Show. In the pens of Three Breeding Sows of the same litter the best pen was disqualified, from the death of the third member, the one which was brought to make up the pen not being from the same litter as the other two. This, however, was mentioned by the man in charge on his arrival at the Show, and the third pig did not come before the Judges. The Old Sows were generally a good class, but there was not one sow with a litter of young pigs amongst them.

Probably some of the best-looking pigs in the Yard were in the next four classes, but the Judges remark that most of them might have been shown in the former classes, as either Large or Small White Breeds. In Class No. 170, after placing No. 1459 first, and No. 1456 second, the Judges were most anxious to recommend No. 1462 for a third prize—a recommendation endorsed by the Stewards, and acceded to by the Council.

As a contrast to the beautiful white pigs in these classes an extraordinary black boar was shown, long-nosed, long-legged, and without any apparent good quality to recommend him. So restless and active was he, that hurdles were placed on the top of his pen to prevent his leaping out, and his lean anxious look was almost painful.

In spite of the dreadful rain, the animals were fairly comfortable in their commodious pens, and were much admired by the crowds of stalwart men and courageous women who were undaunted by the discomfort of the rain and mud.

The Judges presented the following detailed account of the classes and of their awards:—

CLASS 153.—A small entry compared with what we have generally seen at the Royal; only the two placed pigs require any notice.

CLASS 154.—A poor competition. The first-prize boar was a grand square pig, heavy in his flesh, with splendid hair.

CLASS 155.—Only first and second-prize pigs deserve mentioning; the rest were a very uneven lot.

CLASS 156.—A grand lot, especially the first-prize sow; she was a fine specimen of the Large White breed, so deep in her quarters, with capital hair; we commended the whole class.

CLASS 157.—A small class. We should have preferred the highly commended pig for second place, only for his bad head.

CLASS 158.—This was a very good class; after the placed pigs we had to commend the whole.

CLASS 159.—A medium class, showing a little cross-breeding.

CLASS 160.—This was one of the best-filled classes in the Show, and caused the keenest competition for honours, all the pigs being of great merit.

CLASS 161.—No merit.

CLASS 162.—Moderate.

CLASS 163.—A very poor class, second prize withheld.

CLASS 164.—Only the two placed pigs require any special mention.

CLASS 165.—A very middling class, except the first-prize boar, which looked like making a grand stock pig.

CLASS 166.—This class was well filled, but after a little weeding we had not much difficulty in placing the prize animals.

CLASS 167.—Very moderate.

CLASS 168.—This was a very excellent class; after selecting the prize animals we commended the whole, but remarked not a single sow with a litter of pigs.

CLASS 169.—In this class we found some excellent pigs for stock purposes.

CLASS 170.—The competition was so close that we recommended a third prize to be given, which we were glad to see that the Council agreed to.

CLASS 171.—The prize pigs were splendid specimens.

CLASS 172.—This was the strongest class in the whole Show, having thirteen entries, and nearly all of excellent merit; many of the pigs might have been shown amongst the Large White breed.

We are pleased to report to the Society there was not one disqualification, and, with the exception of the Small Blacks, the quality of the pigs compared favourably with the exhibitions of former years.

SAMUEL WALKER.
THOMAS GIBBONS.
JAMES EDWARDS.

BUTTER.

Concerning the large and excellent exhibition of Fresh Butter, the Judges made the following Report:—

We consider the show of *Fresh Butter* as exhibited in Class No. 173—6 lbs. exhibition—to be very good in every respect, whether as regards quality, flavour, or manufacture (68 samples shown). Beyond awarding the five prizes, we had pleasure in highly commending two other samples and commending two samples.

Class No. 174—Firkins or Casks—(of which 32 samples were exhibited) did not show the improvement we anticipated—many samples showing deficiency in flavour, richness, and consequently a deficiency of good keeping qualities.

James Watson.
William Maxwell.
G. W. Burrows.

XXXIII.—*Report of the Senior Steward of Implements.* By W. Frankish, of Limber Magna, Ulceby, Lincolnshire.

After so many Reports in successive years from retiring Stewards, some of whom have had great experience in the management of the Exhibitions of the Society, it is almost impossible to find matter which has not been fully dealt with; however, I take it that the object of these Reports is for one who has served his time to have the opportunity of pointing out such defects, if any are apparent, or such alterations, as may have suggested themselves to him during his tenure of office; but surely, after so many, can defect have a place, or improvement a name? But who of these earlier Stewards could imagine the requirement of nearly 23,000 feet of shedding for the exhibition of Implements, &c. (as at Kilburn), or even the extent of such Exhibitions as Birmingham or Liverpool. The immense space required at these places has necessarily led the Stewards of late years to recommend that steps should be taken to suppress the increasing demand for space, more particularly for articles other than agricultural; and some may now say—I for one—that this has been effected too materially at Carlisle, the space there required being only 9,781 feet. This entails a loss to the Society in various ways, and a disappointment to the many visitors to the Show who have other ideas than those strictly relating to agriculture; who expect variety, and whose support we cannot afford to lose. Thus, therefore, while approving the rule as to duplicates, I record my protest against *excessive* charges for miscellaneous articles, and should recommend that, as evidently even excessive rates will not exclude such persons as had Stand No. 83 at Carlisle, the Stewards be instructed to eject summarily from the Showyard those persons whose exhibits do not accord with their entries, as in cases of this description nothing but the forfeiture of charges incurred and immediate expulsion will deter them. It is imperative, too, if this system of charging differential rates be adhered to, that some line shall be marked out to define what machinery shall be considered agricultural or partially agricultural, and where this is to end. It should also be a matter for consideration, whether, losing, as all societies now do, so much money by the cost of the stock department of the Showyard exceeding the charges levied, the Royal Agricultural Society of England should not take the initiative and confer with the other leading societies with a view to the general reduction of their stock prize-lists: were this effected, I believe our shows would naturally revert to what they were intended to be, exhibitions of "breeding stock." It would then not pay the owners of a few show animals to travel them over the country for the sake of the money value of such prizes as they are able to pick up—animals so fed as to be incapable of propagating their species, however good. But from these animals being so fed, owners of stock in a breeding state naturally do not care to incur expenses with the certainty of having them to compete with. Our prizes should be of more than money value, and would be so considered by breeders in competition with breeders.

Mr. Neville's official Report on the Machinery in the Showyard will no doubt be full and exhaustive, but from the unavoidable absence, so much regretted by all, of the third steward of implements, Lord Vernon, his work in collecting the necessary details was in some degree interfered with by his duties as a steward. I was therefore requested to pay some attention to such stands as were not strictly coming within the classes he is reporting on, and by naming this I trust that such exhibitors may not feel that their interests have been neglected by being omitted in the official Report. It was my duty thus to notice what may be considered the attractive portion of the Implement-yard, and I think no one will be found this year to dispute the fact that the Seeds and Model stands contributed their share to the appearance of the ground. So much has constantly been written in appreciation of the excellence of the Seed stands, and indeed so much is expected of them, that I need only say that Messrs. Sutton, Webb, Carter, and Little and Ballantyne, had their usual effective exhibitions; the latter firm, in addition had a splendid collection of plants, shrubs, and grasses on one of the banks of the River Eden, added much to the naturally ornamental appearance of the ground, and showed great spirit and enterprise in having everything in such perfect order; in this respect Mr. Inman must not be forgotten, his assortment of ornamental summer-houses very efficiently supporting the effect of Messrs. Little and Ballantyne's arrangements.

The principal cake and manure manufacturers of the North had stands exhibiting the various articles of their trades, both in the manufactured and unmanufactured forms; and, although necessity gives importance to these things, and art gives what charm it can, the public do not appear to appreciate the producers so much as the productions. Excessive charges had evidently effected its purpose with the carriage-builders; but it was pleasing to notice that two local firms had the pluck to exhibit (I hope they found a proper reward),—Messrs. Atkinson and Philipson and Messrs. W. and J. Proud; the latter had a good assortment of carriages suitable to the country, the principal feature of which seemed to be that the ends of the shafts played loosely in a socket, thereby tending to avoid the action of the horse on uneven roads. Messrs. Atkinson and Philipson had a large collection with some novelties in construction, the most important of which appeared to be an india-rubber buffer-spring round the axletree for the main spring to work on, an arrangement which seemed to act very effectively; the main springs were the new American pattern, consisting of one plate of cast steel, thick in the centre, and thinning towards each end, the ends working loose in an oiled socket; these springs had great elasticity, and apparently still adapted themselves to great weight; there is nothing to cause rust or decay. Without a trial no opinion is reliable, but these springs have certainly the appearance of a move in the right direction—another score to the Yankees. The harness exhibited by this firm was also of excellent construction.

The stand of Canadian exhibits contained fine specimens of timbers, seeds, corns, and grasses; the latter were coarse, but evidently very productive. But this stand, with its seductive views and plans of the country, appeared more as an advertisement to encourage emigrants than anything else.

The bee manipulations were of the usual interesting character; and some method was shown on another stand for the impregnation of the ova of fishes; but these, to give a lucid explanation, require the special knowledge of the apiarist or of the pisciculturist.

In conclusion, it is with the greatest pleasure I add my testimony to that of others as to the cordial co-operation of everyone working or acting on behalf of the Society, from the Presid of the Society, whosoever he may be, downwards; to the indefatigable zeal of the Secretary, to the foresight and everthoughtfulness of the Steward of general arrangements, and to whom, after the experience of the last few years, it may be trusted to carry the operations of the Society through any reverses that may arise. And surely it can have been the lot of few to have experience of two such Showyards of wet and mud as Kilburn and Carlisle; and yet a most pleasing and instructive feature at the latter Show was the attendance in one day of over 40,000 people, evidently agricultural, male and female, who encountered all difficulties most bravely and cheerfully, resolutely intent, in spite of all, on seeing everything to be seen; the moral to be deduced being, that the "Royal Show" has not lost its attraction for an agricultural population, and that, if its expenses are kept to proper limits, the Council need not fear going to agricultural districts.

Trusting the few remarks I have felt called upon to make may be taken *cum grano*, and thanking every one with whom I have come in contact for their kind co-operation and for the leniency with which many deficiencies have been overlooked, I take leave of an office which has been both a pleasure and an instruction, bringing many new acquaintances and I hope leaving many new friends.

XXXIV.—*Report on the Exhibition and Trials of Implements at Carlisle.* By Robert Neville, of Butleigh Court, Glastonbury.

The Society's Exhibition of Implements at Carlisle may be considered to have been in every way most satisfactory; for, although the weather during the Show was as bad as last year at Kilburn, the Society had the advantage of getting all the machinery in place while it was perfectly dry: indeed, the Carlisle people all agreed in saying that up to the time of opening they never remembered a longer spell of fine dry weather; so, although during the Show the mud and slush painfully reminded one of the last terrible time in London, a good sound bottom to the Yard had been preserved.

The extra charge this year for miscellaneous shedding certainly had a most beneficial effect in reducing those exhibits, the usual long lines of carriages being entirely absent, and indeed duplicates of any description were hard to find. This is as it should be for an agricultural show, and agricultural visitors; but how far the change may affect the general pub and the Society's finances, experience must determine.

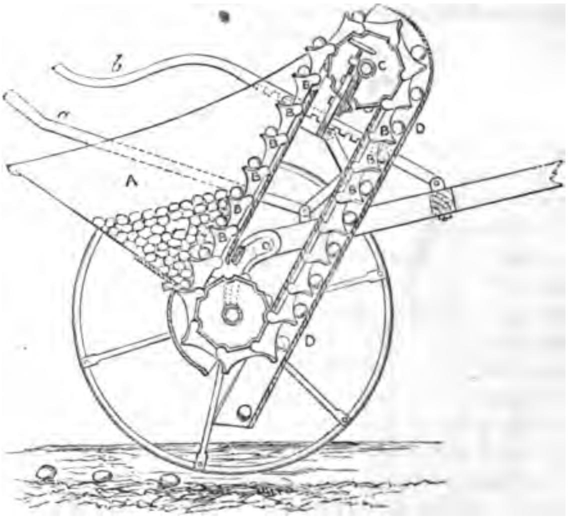
There was a large show of milling appliances, some of whi seemed to point to a growing tendency to replace the old mi stones by rollers of various sorts, which is reported to be dc to a large extent in Hungary, where the best and finest flc is made.

There were many improvements in sheaf-binders. Seve looked most promising; and if each year they improve as fast they have done in the last two years, it will not be long bef English farmers will find themselves supplied with machi well suited to their wants; but in the face of the recom i of the Judges, that there should be next year a trial o binders using any other system than wire, I will pass by t machines, which no doubt will then appear in a still m perfect shape.

Six Silver Medals were awarded at Carlisle to exhibits whi I will describe according to their Catalogue numbers.

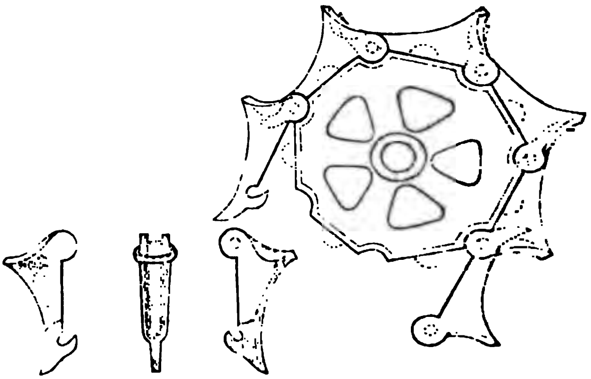
No. 290. *G. W. Murray and Co., Banff Foundry, Banff*- Silver Medal for their Two-row Potato-planter, price 18*l.* 1

Fig. 1.—*Section of Messrs. Murray and Co.'s Potato-planter.*



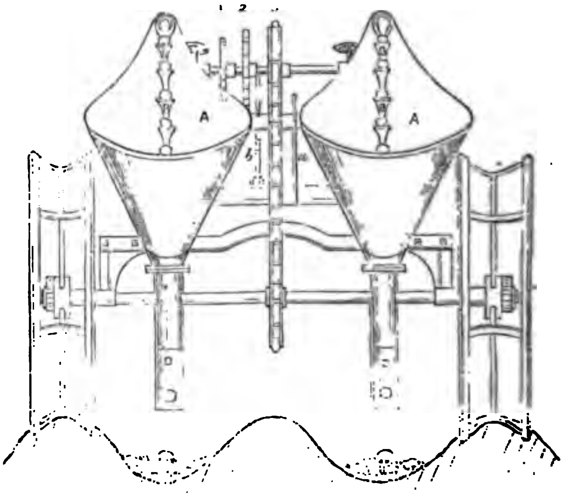
which when tested by the Judges on the grass in the Yard, g every satisfaction; the potatoes were deposited at perfec equal distances, and in a length of 56 yards there was only c miss in each row, which probably would not have happe had the machine been working in the field. The cups whi take up the seed are each a link of an endless chain, mer

Fig. 2.—*Details of the mechanism of Messrs. Murray and Co.'s Potato-planter.*



hooked into each other; and on the end of each cup is a ta which as the chain turns over the supporting wheels, rises i

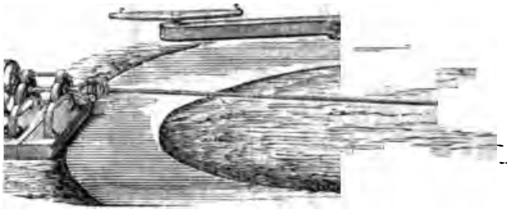
Fig. 3.—*View of the mechanism of Messrs. Murray and Co.'s Potato-planter.*



through the bottom of the succeeding cup, thus not only e suring the seed leaving the cup at the right moment, but clea ing out any dirt that may have accumulated there. This is an important improvement, and effectually remedies a hitherto existing fault. Motion is communicated to the cups by means of the well-known Ewart's detachable drive-chain, and there is also an adjustment for properly balancing the machine when going up- or down-hill. The seed can also be dropped at three different distances apart by a very simple arrangement of change wheels. The machines are made either double or single.

No. 2503. *John Crowley and Co., Sheffield*—a Silver Medal for their new Horse-gear, the novelty of the principle being a step in the right direction, viz., in having the large wheel fixed and forming the main base to the machine, instead of revolving as usually is the case. The shafting can be led off at different angles, or three shafts can be driven as required. The machine was tested on the dynamometer, and though only for one horse, stood the test of transmitting four-horse work, and gave out good duty. There was no proof of any more economical transmission of the power over other good horse-gears, but the proportions, principle, and workmanship were decidedly good.

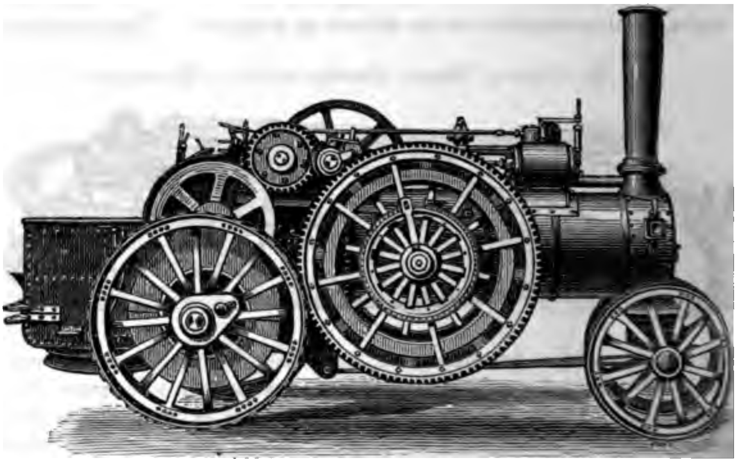
Fig. 4.—*View of Messrs. Crowley and Co.'s Horse-gear.*



No. 2871. *Barford and Perkins'* self-acting arrangement for lifting steam cultivators, drags, or other similar implements, stands next on the list, and well deserved the honour of the medal it gained. It is of great importance in the roundabout system to be able to lift the implement just before the end of the pull, so that when the anchor moves on, the engine shall not have to pull both it and the cultivator at the same time. Other means are used to obtain this result, which will be described in their place; but none are so simple or mechanical as this one. On the boss of the cultivator wheels is a ratchet with 8 teeth; the axle is cranked as in other lifting cultivators, and on the cranked part is carried, in bearings, a shaft on which are two double cams, each with five teeth on either part; these, by a simple movement of the foot, gear into the ratchet-wheels, and lift the cultivator, which is held in its position by the ordinary apparatus; the cams immediately swing clear and are ready for another lift.

No. 3226. *Everett's Patent* 10-*horse-power Steam-plough Engine*, made by *Charles Burrell and Sons, of Thetford*, which, although shown last year, has now been much improved. It was worked in the trial-field and gave the Judges great satisfaction by the way in which it moved about and set down its roundabout tackle, and worked various implements as directed. It has one cylinder, 10 inches diameter by 12 inches stroke, and works up to 150 lbs. pressure. A pinion of 11 teeth on the crank-shaft gears directly into a spur-wheel of 107 teeth bolted on to the periphery of the winding-drum; the drums are carried by brackets and studs bolted on to the boiler, are of wrought-iron, and can carry 1000 yards of ⅝-inch diameter wire-rope; being vertical, no coiling-gear is required as in the horizontal ones, but probably the life of the rope would be prolonged if there were such an arrangement. The rope leads round a large horizontal guide-pulley under the tank, and thence at any angle to the implement. The travelling-gear is fitted with two speeds in a very efficient manner. When used for double-engine tackle there is only one drum to each engine, being made right- and left-hand. The price of the engine exhibited was 620*l.* without rope.

Fig. 5.—*Everett's "Universal" Ploughing and Traction Engine.*



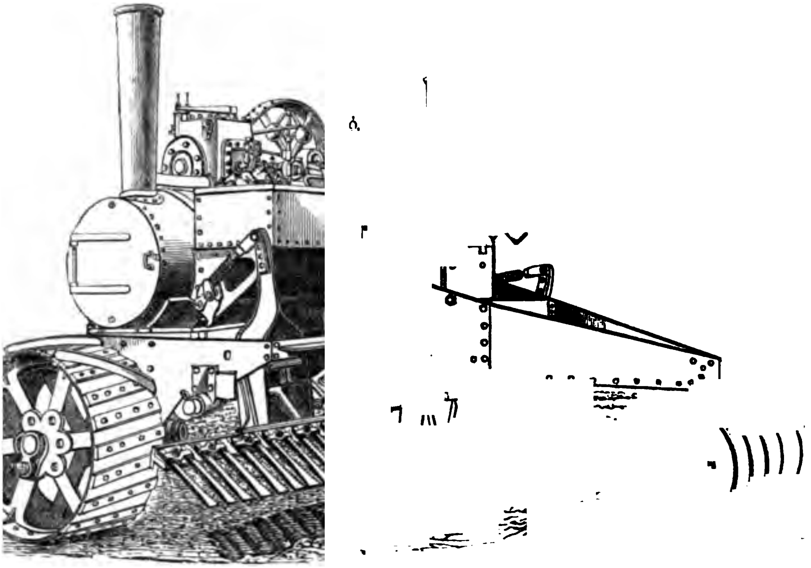
No. 3262. *Nalder and Nalder*, Wantage, obtained a Silver

Medal for their Straw Elevator as attached to a threshing-machine. This was shown last year at Kilburn, but there then being no opportunity of trying it, it was brought again before the notice of the Judges, who this year were able to work it.

As there was a good description and drawing of it in last year's 'Journal' it is only necessary to state that there is no material alteration in its design, but some improvements in minor details which a year's experience has suggested. In the trial the straw was delivered at various heights and round one-third of a circle, and the apparatus was packed-up for travelling on its accompanying threshing-machine in ten minutes.

Of all the exhibits, the *Darby Digger*, No. 3566, made by *J. and H. McLaren*, Leeds, probably caused the greatest amount of interest; and from its bold departure from all existing methods of steam cultivation, was by far the best response the Society had to its offer of trials for any new implements for the cultivation of the soil by "steam or other mechanical force," and well deserved its Silver Medal. Although there have been rumours of ploughing by electricity, nothing of the sort has as yet been shown in England; and until now, with the exception of some

Fig. 6.—*View of Darby's Steam-digger.*



very early attempts, the various systems of cultivation by means of ropes of steel or hemp have been unassailed.

The Digger has been before the public for several years in a comparatively crude form, but is now much simplified, and promises to develop into a useful machine. It consists of a locomotive boiler, with a fire-box in the centre, the tubes on each side, and a funnel at each end. The engine is fixed on the top of the boiler, and has a single cylinder, 9 in. diam. by 12 in. stroke. On the crank-shaft are two bevel pinions, one of which drives the travelling-wheels through intermediate gear at either of two speeds; the other drives the digger, which consists of three sets of tines, 13 in the centre set, and 14 in each of the outside sets, making a total width of land worked of 20·7 feet. A horizontal crank-shaft, running the length of the boiler, and with Hooke's joints between the cranks, drives the diggers, and revolves once for every 3·92 revolutions of the engine. When digging, the axis of the travelling-wheels is parallel to that of the boiler; and all are driven, but any or either can be disconnected, the two outer ones by pins, the inner ones by clutches. The steering is effected by a frame hinged on to the foot-plate, and in the rear of the diggers, carrying a set of discs, which, by means of a hand-wheel, can be turned to any angle and act as a rudder. When in travelling-trim this frame is unshipped, and the driving-wheels are disconnected and turned round with their axes across that of the boiler in the ordinary way. One pair is connected with a hand-wheel, and used as steering-wheels; the other pair is connected with the engine, and propels the machine. The wheels are 3 feet 6 inches in diameter by 2 feet wide.

The Digger was well tried in the field, but the land being very dry was all in its favour. Then came two days' heavy rain. How will the Digger go now? was the general remark of those interested; so, at the request of its makers and Mr. Darby, it was again taken out, and, to the surprise of all worked as well as before; but, in spite of at least two inches o rain, the land was of such a quality as not to be much affected by it, and any ordinary steam-plough would have worked How the Digger will act in wet slippery clay it was impossible to prove. The work appeared equal to, or even in som respects better than, ordinary ploughing, but not so good a cultivating or digging, as far as laying the land up rough f fallowing, which is generally what is wanted where steam used; but this could doubtless be altered by using differentl shaped tines. The following are the results obtained by t Society's Engineers:—

Particulars and Performances of Darby's 8-Horse-Power Broadside Steam Digger, Exhibited by Messrs. J. and H. McLaren.

The engine is 8 nominal horse-power, with single cylinder 9 in. diameter, 12 in. stroke, 120 lbs. safety-valve pressure in boiler.

	Square Feet.
Heating surface in fire-box	35·5
„ tubes, &c.	135·8
Total	171·3

Grate surface, 6·64 square feet.

Gearing.—Engine crank shaft makes 3·92 revolutions to 1 revolution of digger shaft.

The digger tines are spaced about 6 in. apart from centre to centre, and are contained in 3 frames, which are worked by cranks set at equal angles with one another.

There are 13 tines in the centre frame, and 14 in each outer frame, making 41 tines in all.

Effective width dug as implement advances, observed as .. 20·7 ft.

Weight of implement (given by Messrs. McLaren):

	Tons.	cwt.	qrs.
Engine, boiler, coals, and water, carried on 4 main travelling-wheels	13	10	2
Frame and discers	1	17	1
Total	15	7	3

4 travelling wheels, each 3 ft. 6 in. diameter, 2·0 in. wide.
Load on wheels per inch width of tyres, 316 lbs.

Experiments with Digger at Carlisle, July 10.

Mean depth dug .. .. 6·07 inches =	·506 ft.
Weight of unmoved earth per cubic foot .. .. =	105·1 cubic ft.
Advance of implement (when spuds are on wheels) per revolution of digger shaft	1·028 ft.
Advance of implement per revolution of engine ..	·262 ft.
Average revolutions of engine per minute	180
Advance of implement per minute	47·5 ft.
Volume of earth moved per revolution of engine ..	2·74 cubic ft.
Weight do. do.	288 lbs.
Mean foot-lbs. of work indicated do.	5254 ft.-lbs.
Indicated work in engine cylinder per lb. of earth moved, or height in feet to which earth moved must be raised to represent work done (mean of 6 experiments)	18·2 ft.-lbs.
Mean indicated horse-power when working straight ahead	28·7 h.-p.
Mean indicated horse-power working and turning at ends	26·0 „
Mean indicated horse-power running light over land straight ahead, but with diggers out of gear ..	16·5 „
Ratio of power required to move implement without digging to power required when digging	·575
Time occupied for each half-turn at ends of furrows, digging at same time (favourable instances) ..	2¼ minutes.

Area dug per hour, assuming furrows to be 200 yards long	1·19 acres.
Average indicated horse-power required for this rate of progress	28·3 h.-p.

A few days subsequently to the above trials, viz., on the 15th July, the Darby Digger was taken out to the same ground after continuous heavy rain, and worked direct up a hill-side on a slope frequently exceeding 1 in 10 at an engine speed of 200 revolutions per minute; it also worked on the flat, and crossed some fallows; the last-named operation, however, was only done with difficulty in the then wet state of the ground.

Performances of Burrell's 10-*Horse-Power Ploughing-Engine (Everett's Patent), working a Fowler* 4-*Furrow Balanced Digger (lent to the Society by Messrs. Fowler), at Carlisle, July* 10, 1880.

One engine, cylinder 10 in. diameter, 12 in. stroke, boiler pressed to 150 lbs. pressure.

	Square Feet.
Heating surface in fire-box	32
„ in tubes	133
Total	165

Fire-grate surface, 5·5 square feet.

The whole of boiler made of Landore Siemens steel.

Weight complete, including water and coals, 13½ tons.

Two 11-tooth pinions on engine crank shaft, drive a wheel with 107 teeth on each drum.

	Feet.
Average length of rope wound on drums per revolution of drum during trials	18·4
Advance of implement per revolution of engine	1·89

Digger has 4 breasts, with
  Furrow wheel 5·0 in. diameter, 4¾ in. broad.
  Land wheel 4·6 in. diameter, 5⅞ in. broad.
  Skid wheel 13½ in. diameter, 4½ in. broad.
Weight, 34 cwt.
Weight per inch width of tyres, 362 lbs.

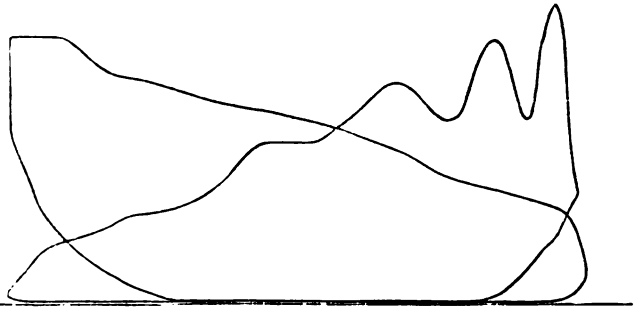
Average width dug .. .. .. 40·5 inches =	3·375 ft.
Average depth dug .. .. .. 6·02 inches =	·502 ft.
Weight of unmoved earth per cubic ft.	105·1 cubic ft.
Volume of earth moved per engine revolution	3·20 cubic ft.
Weight do. do.	336 lbs.
Mean foot-lbs. of work indicated in engine per revolution	8221 ft.-lbs.
Indicated work in cylinder per lb. of earth moved, or height in feet to which earth moved must be raised to represent work done (mean of 9 indicator experiments)	24·4 ft.-lbs.
Average revolutions of engine per minute	180
Mean indicated horse-power in straightforward work	44·8 h.-p.
Do. do. when dragging the rope and implement light over ground without digging	18·3 „
Ratio of power required to move rope and implement without digging to that required when digger is working	·408

Area dug per hour, if we allow furrows to be 200 yards long, and supposing ½ minute lost at the end of each furrow from the time digger stops till it starts to work again	1·22 acres.
Average indicated horse-power while working at this rate, allowing nothing, however, for moving anchors	34·9 h.-p.

Comparison of Economic Performances of Darby's Digger with those of other Diggers, so far as regards the power required to dig 1 lb. of earth.

		Indicated Work of Engine in Foot-lbs. per 1 lb. of Earth moved, or Height to which Earth must be raised to represent Work done.
DARBY DIGGER at Carlisle, July 10, 1880		18·2
FOWLER DIGGER „ „ worked by Burrell's engine and tackle. (N.B. This should not be taken as an official trial, as the implement was only lent to the Judges of the R.A.S.E. by Messrs. Fowler, to enable them to institute a comparison, and it was not worked by their own tackle)		24·4
[*FOWLER'S 6-FURROW DIGGER at Stafford	22·2	21·8 average.
„ 5 „ „ ..	22·6	
„ 4 „ „ ..	25·9	
„ 4 „ „ ..	19·8	
„ 4 „ „ ..	18·6	
HOWARD'S 4 „ „		21·8
FOWLER'S 4 „ „ Wolverhampton, worked by Fisken Roundabout Tackle (mean of 5 trials at various speeds)		21·9]

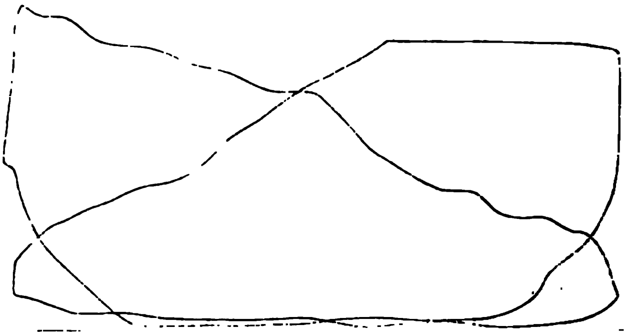
Fig. 7.—*Specimen Diagram from Darby's Broadside Digger Engine in full Work, digging.*



Scale **40 lbs. to 1 inch, 180 revolutions per minute, 115 lbs. steam, engine cylinder 9 in. diameter, 12 in. stroke.**

*** Extracted from Table III., Wolverhampton Trials, 1871.**

Fig. 8.—*Specimen Diagram from Burrell's 10-Horse-Power Engi (Everett's Patent), working Roundabout Tackle and Fowler 4-Furrow Digger.*



Scale 40 lbs. to 1 inch, 180 revolutions per minute, 110 lbs. steam, engine cylinder 10 in. diameter 12 in. stroke.

EASTON AND ANDERSON,
Consulting Engineers, R.A.S.E.

Messrs. John Fowler and Co., Leeds, amongst their steam-ploughing machinery, had an eight-horse-power Double Drum Engine on a new principle, and which certainly looked a great improvement on those hitherto made. A set of roundabout tackle was at work with one of these engines in a field near the Yard, and gave people a very good idea of its capabilities. One drum is hung under the boiler in the usual position, and is driven by an upright shaft; on this shaft, immediately above the lower bearing, is a bevel-wheel, giving motion to a horizontal shaft running alongside the fire-box; and this, by means of bevel-gearing, drives a short vertical shaft with a pinion-gearing into the hinder drum, which is carried on a stud fixed on the bottom of the tank, this being made strong enough to withstand the strains put upon it.

The engine can be worked in three ways—(1) Along the headland opposite to a self-moving anchor, and so have a direct pull upon the implement; (2) remaining stationary, and working with two self-moving anchors; or (3) as one of a pair of engines.

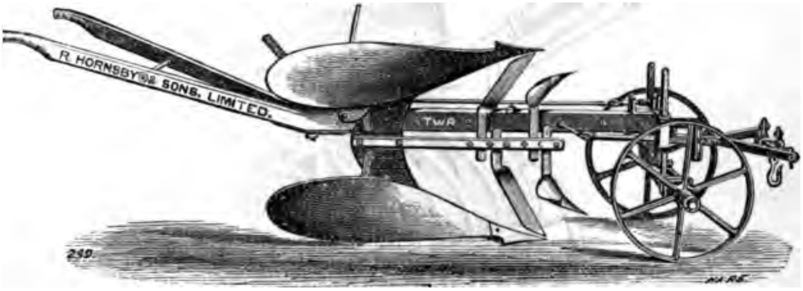
The makers do not claim that this principle is better than a pair of engines, but that it is a most efficient single engine set, embodying, as far as possible, the advantages of the double system.

The anchor used with this tackle is entirely self-acting; it is moved along the headland by the direct pull of the hauling-rope; and the distance it moves forward each bout can be controlled by the ploughman without his leaving the implement.

R. Hornsby and Sons (Limited), Grantham, showed in article 3305 (Fig. 9) an improved Turn-wrest Plough, well designed and made, and which would doubtless do excellent work, and quickly, but it would not stand the treatment farmers very often give their ploughs, viz., leaving them under a hedge until again wanted.

The plough-bodies are hung under the beam on turned pins, so that when set either way for work, the one in use lies against the side of the beam, and is held in its place by a fork, which wedges it and makes it practically solid with the beam. By pulling back a lever the bodies are released, they automatically change places, and the plough is ready for work the opposite way. The fore-end of the beam is arranged so that the depth required to be ploughed can be set by simply adjusting two stop-plates, thus equalising the depth for both ways; the draught is then self-acting, as well as the draught-bar, which thereby pulls in the line required by the plough at work.

Fig. 9.—*Messrs. R. Hornsby and Sons' Turn-wrest Plough.*

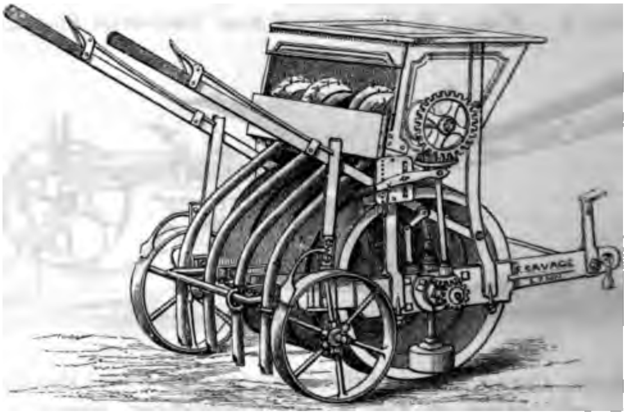


Messrs. Burrell and Sons, Thetford, exhibited, amongst other things, Everett's Patent Automatic Travelling Anchor, which can move either backwards or forwards as desired. On the anchor is a horizontal drum, on which are about 80 yards of wire rope, the end of which is made fast to an anchor, and is payed out as the travelling anchor advances. By an arrangement of gearing the motion is reversed and the rope hauled in, the anchor consequently "backing" as far as requisite. This was shown at work in the trial-field, and was apparently capable of doing all that its makers claimed for it.

Messrs. Fisken and Co., Leeds, had at work in the trial-field an Improved Set of Tackle, driven as usual by a quick-speed manilla rope, and consisting of one three-furrow balance-plough and windlass combined, two self-moving anchors, and porters and ropes for a furrow 300 yards long. The price reduced to 200*l.* The improvements mainly consist in not carrying the rope all round the field, but in two lines parallel with the furrow; and the windlass is again mounted on the plough, in somewhat the same manner as it was at the last Royal Agricultural Society's Show at Carlisle in 1855.

Mr. Frederick Savage, King's Lynn, Norfolk, worked in the trial-field a ten-horse-power Agricultural Engine. The driving-wheels form the winding drums, as is usual in these engines. The anchors are self-moving, and the whole weight rests on the retaining tines. A new implement was shown in connection with this tackle, viz., a four-ring self-acting Presser and Drill Combined, to be used behind the plough. A swivel foot, lowered on to the ground by a lever, takes the weight of the presser in turning at the headlands. A small harrow is also attached, and drawn behind the presser, for covering the seed. This is the first implement of the kind ever made, so doubtless many improvements on it will appear in time, and in certain hands on some soils will probably prove of considerable value.

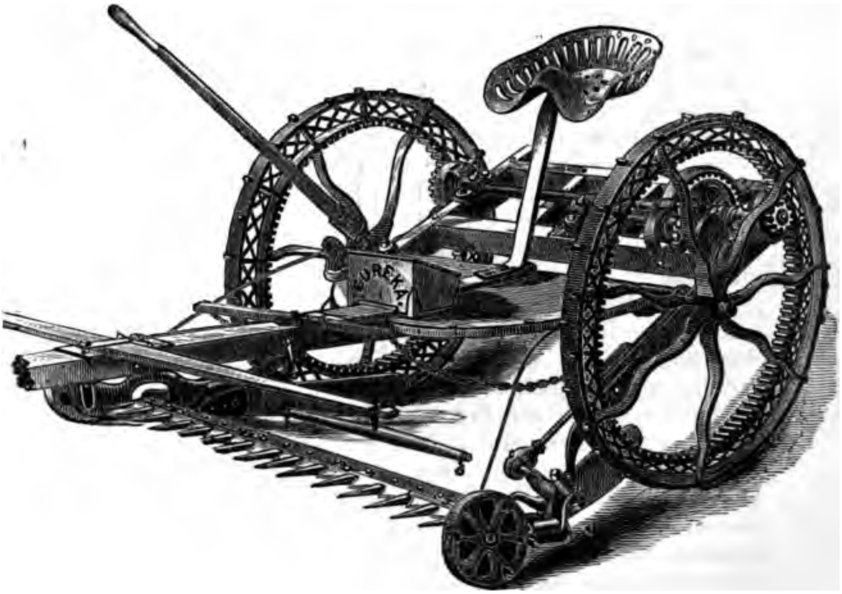
Fig. 10.—*Savage's combined Self-acting Presser and Drill.*



Mr. J. A. Mays, 223 Gresham House, London, showed a curiously contrived Revolving Railway attached to the driving-wheels of a six-horse-power Traction Engine, which consists of a series of plates or feet about 15 inches square, connected by links and ball-and-socket joints to a ring, which ring fits on to the driving-wheel, and the two are only connected by the frictional adhesion caused by the weight of the engine. As the wheels revolve the feet come down on to the ground and are picked up in turn, two being on the ground at once. The feet are faced with wood strips. One of the wheels met with an accident on the way to the field, so the engine had to work with one, and was made to pull a five-furrow plough. The advantage of this application is exceedingly doubtful, but it may be as well to record in the 'Journal' that such a machine has been exhibited.

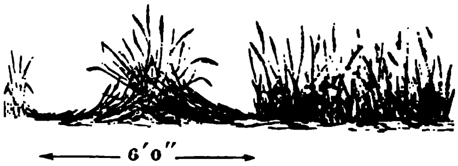
Messrs. Everett, Adams, and Co., Ryburgh, Norfolk, exhibited the Eureka Mower, an American invention, which is certainly well deserving the attention of farmers. A somewhat similar machine was made some years ago, but was found to have several defects which are now apparently overcome. This machine was well tried by the Judges in the field, and cut a fair crop of alsike-clover and bents, which instead of being laid flat, as by other machines, was left light and loose, the centre of each swathe, owing to the outside falling inwards, being kept upright, and almost looking as if it had not been cut at all, which must considerably quicken the drying. Although tried with the horse-dynamometer, it was impossible to obtain any results, owing to heavy rain coming on, and the dynamometer having to travel in the long grass in front of the machine rolled it down, and thus entirely altered the conditions from those of ordinary work. The draught must be very much less than in

Fig. 11.—*View of the Eureka Mower exhibited by Messrs. Everett, Adams, and Co.*



ordinary machines, owing to the direct pull the horses exert. One walks in the long grass, the other just outside: at the end

Fig. 12.—*Illustration of the Swathe left by the Eureka Mower.*



of the field the machine turns, not being driven round and round as other mowers, so that the grass trodden down by the horse one time is effectually cut the next. The wheels are 3 feet 6 inches in diameter. There are no bevil wheels, motion being imparted to the knife by a bell-crank, so either end of the knife is free to rise or fall as it likes, and is easily raised by the driver when required. A six-feet cutter-bar is used, which is supposed to be equal in draught to an ordinary 4 feet 6 inches machine.

Messrs. Richard Garrett and Sons, Leiston, have certainly made a step in the right direction in the shape of a Compound Portable Engine. Messrs. John Fowler and Co. and others make "semi-fixed" compound engines with the cylinders underneath the boiler, but this is the first true portable compound ever made, or at any rate ever exhibited in the Society's Yard. In a few words, the advantage of this system is obtained by using a high pressure, and expanding it down as low as possible. The great revolution which the adoption of this method caused in marine engines, by reducing the consumption of coal by more than 50 per cent., has been one of the chief causes which have helped on the importation of foreign food from long distances; so if hitherto it has somewhat operated against the interests of English farmers, the time may now have come when it will prove a good ally. The engine in the Yard was 10-horse-power, with cylinders 7¾ inches and 11¼ inches in diameter by 10 inches stroke. The cranks are at right angles. The steam pressure is 80 lbs. and the cut-off in the high-pressure cylinder is at half-stroke. The makers state that considerable economy in fuel is shown by this engine over ordinary portables, and no doubt at some future time the system will be brought more prominently under the Society's notice; but a higher pressure of steam than 80 lbs. must be used to get the best results, and as 150 lbs. is now constantly used in railway locomotives, and even in ploughing engines, why should the working pressure of portables remain, as is almost universally the case, at the old-fashioned 60 lbs.?

Messrs. Armstrong, Addison, and Co., Sunderland, showed Gates, Fencing, and Wood-paving pickled by their process, by means of which great durability is ensured. They state that sleepers so treated have been in use on the North-Eastern Railway for twenty-seven years; and that wood-pavement on the Sunderland Bridge is still good, although for thirteen years it has been subjected to heavy traffic.

Messrs. Richardson and Son, Carlisle, showed a Potato-sorting Machine, which efficiently makes three clean separations, large, seconds, and small, the dirt falling by itself. It consists of a series of screens of galvanised wire, and is an adaptation of the principle of the winnowing machine, being worked in a similar manner by hand. Several minor details of construction appeared capable of improvement, which will no doubt be done in future, the machine in the Yard being the first of its sort.

Messrs. Perkins, Paternoster, and Burlingham, of Hitchin, had a collection of Polygon Corn-screens of various sizes, suitable to both farmers and seed-growers, which, by varying the barrels, can be made to separate any different sorts of seed. No. 712 in the Catalogue is stated as being capable of screening from 40 to 60 quarters of corn per day by hand-power.

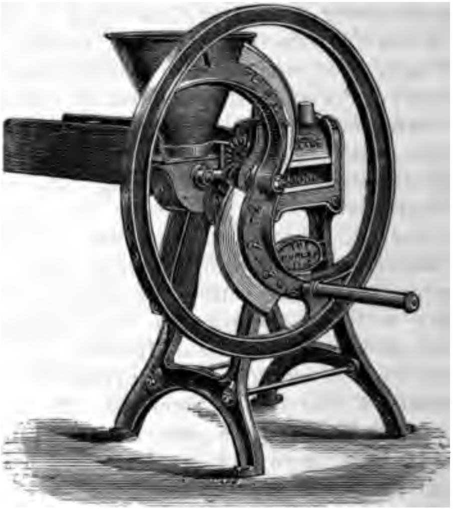
Messrs. J. and F. Howard, of Bedford, exhibited a new Plough, steel being used instead of wrought iron. The beam is bent round in one piece, and carries the share and mouldboard, thus doing away with the casting that has hitherto been used, and making the plough stronger and lighter.

They also showed a new class of Haymaking Machine, the travelling wheels of which are mounted on axles, with an eccentric movement, so that by a partial revolution of the axle the gearing is thrown in or out, the large tooth-wheel on the axle has "open teeth," so that if any grass or dirt gets on it they are punched through by the teeth of the pinion. The fork-head springs, which are important points in a haymaker, are simply straight strips of riband steel, which are just the right length when the forks are in either position to retain them there without being in a state of compression. They thus seem effectually to fulfil all the required conditions, and can be replaced without any tools.

A Steam Cultivator, with a harrow slung to it from a pair of bell-crank levers, the other arms of which are connected with the turning lever, which lifts the harrow clear of the ground at the moment of turning, is a very neat and novel arrangement, and was also exhibited by Messrs. Howard, amongst other steam-cultivating appliances.

Messrs. Hunt and Tawell, Earl's Colne, Essex, showed a combined Chaff-cutter and Oat-mill; also a similar machine, but with a bean- or maize-mill as well. This is a most suitable machine for small stables; and it is in these places that the prejudice which coachmen and grooms have against giving horses chaff and bruised corn is most rife. These machines must reduce the trouble of doing this to a minimum, and are therefore well worth the attention of those who keep even one horse. The chaff-cutter has two knives, either convex or concave, as required, fitted on to a suitable fly-wheel, the mouth being 8¼ inches by 2¾ inches. The crushing part is fixed on the side of the machine, and has a double solid-steel roller; the cutting-plates are made with a fluted strip of hardened steel dovetailed into the ordinary cast-iron back. The hopper has a division in it, which is turned to one side or the other, for beans or oats, as required. The knives are prevented from rubbing against the face when grinding by slacking a nut on the shaft, when a spring washer behind the wheel forces it outwards and so gives clearance. The makers state that the machine will crush from 2½ to 3 bushels of corn, or cut 2 cwts. of chaff, per hour, and is specially designed for exportation.

Fig. 13.—*View of Messrs. Hunt and Tawell's combined Chaff-cutter and Oat-mill.*



Messrs. Andrew Handyside and Co., Derby, showed a new double-action root-stripper and slicer. The cutters are so arranged on the disc that when the machine is turned in one direction it produces slices; when in the other, finger-pieces, without any alteration of knives or knife-bars. A modification of this machine is also combined with a chaff-cutter, the two operations of chaff-cutting and pulping going on simultaneously, so that the two products in falling get thoroughly well mixed up together, and all the juice of the roots is at once absorbed by the chaff, thus saving both the labour of mixing afterwards, and a certain amount of waste of material.

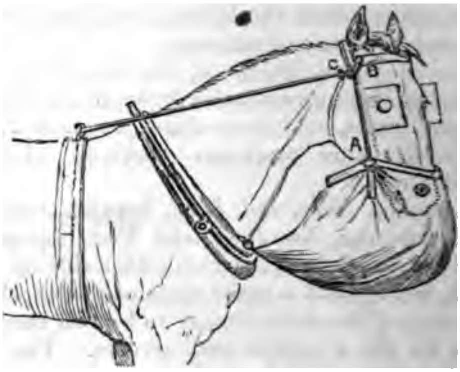
Messrs. Haughton and Thompson, Carlisle, had a good collection of Threshing Machines suitable for small farms; also mowing and reaping machines, and horse-rakes, broad-cast seed-sowers, land-rollers, and other machines specially adapted for the surrounding district.

Messrs. Ransomes, Sims, and Head, Ipswich, exhibited a new Self-acting Horse-rake, No. 2187, with T-section steel teeth, the motion being obtained by a lever on either side of the rake, the ends of which, being bent over the tyres of the wheels, are, by the action of the foot of the driver, made to bite on them, and so are carried round by the wheels as they revolve. The other ends of the levers being attached to the rocking frame of the rake, to which the teeth are hung, thus lift the teeth, which can be held in this position as long as desired, either for delivering the load, turning, or backing.

This firm has also a good improvement in the tines of their Haymaking Machines. The tines must be curved to carry the hay well over the machine when scattering, but for turning, straight tines leave the hay much lighter; so by making the tines alternately straight and curved, the machine will work equally well in either action. The gearing is strong and well protected, and the machine reduced in length, thus lessening the draught and weight on the horse's back.

Many of the readers of this 'Journal' must, when walking about in London or other large towns, have been struck by the quantity of oats scattered on the ground, especially near cab-stands, owing to the horses tossing them out of their nose-bags whilst feeding. This defect is completely overcome by the "Kennett" Nose-bag (Catalogue, No. 1154), exhibited by *John Unite*, 291, Edgware Road, W., the Society's contractor for canvas. The other advantages claimed for it are: "The horse breathes easily, there being large brass eyelet-holes round the bag near his nose; the dust is not tossed into his nostrils, the greater part of the weight is supported by the neck, and there is no wear and tear of the bag against the ground." In shape the nose-bag is like a sock cut off above the ankle; into this part the horse's nose goes, and it is suspended from the head. The toe of the sock hangs under the neck of the horse, and here most of the corn lies. When the horse wants a mouthful he lowe his head a few inches, and the food slides down; he the naturally raises his head, eats his mouthful clear of the re mainder of the feed, breathing freely, and repeats the proce

Fig. 14.—*Illustration of the "Kennett" Nose-bag.*



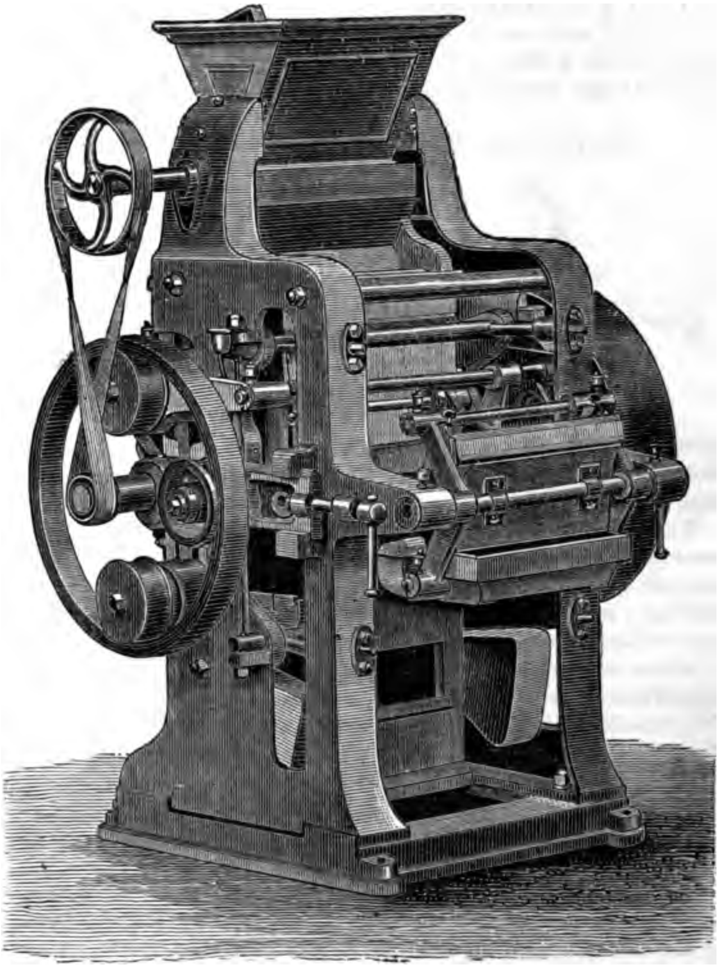
as he desires. Thus the corn can be completely consume without tossing, and without any attention on the part of hi driver.

The nose-bag was put on to a horse in the Yard, which ha never had one on before, and which fed out of it with apparentl the greatest comfort.

This invention is well worthy of the attention of horse owners, and probably, as in many other good and simple con trivances, the main objection they will find in its use will b the prejudice of their men against even trying anything new.

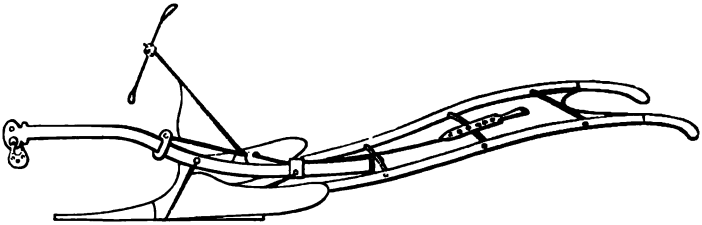
Mechwart Buchholz' Complete Corn-grinding Roller-mil (No. 3711), made by Ganz and Co., price 155*l.*, and exhibite by *Buchholz and Co., Royal Flour Mills, Vauxhall*, is a machin as the exhibitors claim, "destined to replace mill-stones fo economy of power and the production of a higher quality of flour. This "Low-grinding Roller-mill," as it is also called, has thre iron rollers; the grain is first crushed by the top pair, it then fall on to the lower end of an inclined sieve, which, owing to peculiar kicking motion, tends to work the meal gradually u the incline; and thus the sieve is made so effective that half th usual area only is required. The meal then falls on to a lowe sieve, and all that requires further grinding passes between th second and third rollers. By this machine, the importers sa that "it is possible to reduce wheat to flour and bran in th most direct and simple manner through rollers, *whereby th whole produce of the flour is raised in quality and value.*" B this as it may, the machine is exceedingly well constructed; the rollers are made of special metal, and carried by an anti-friction ring which allows great pressure to be put on them without injuring the bearings.

Fig. 15.—*Messrs. Buchholz and Co.'s Corn-grinding Roller-mill.*



No. 2932, *James Harkness*, of Gretna, Dumfries, the veritable Gretna Green smith (who during the storms amused us all in the trial-grounds with many curious stories of that celebrated place), exhibited some Drill Ploughs, one of which was taken out into the field at the special wish of the Judges, who were much struck with the design of it. The plough-point is carried well to the front, and so comes much closer to the point of draught than usual, and the handles being also a good length, the ploughman has great power over the implement. The mouldboards are hinged, and can be readily expanded or contracted by a rod which moves a sliding block on the beam, the block being connected to the mouldboards by two short links with a simple joint at each end. A land-marker is attached, as is usual in all North-country ploughs and drills—a refinement seldom or never seen in the South.

Fig. 16.—*View of Mr. James Harkness' Drill Plough.*



The plough was tried on some of the land that had recently been steam-cultivated and harrowed, and in spite of the awkwardness of a horse quite raw to the work, made very good drills, and fully bore out the opinion of the Judges that it is a handy and well-constructed implement. Its price is 3*l.* 15*s.*

There were two exhibits which properly belonged to the Stock department, but as they found their place in the Implement-yard they should perhaps be mentioned in this Report, viz.: the Bee Tent, brought by the British Beekeepers' Association, and the Fish, by Mr. J. L. Armistead, of Roundhay, Leeds.

Owing to the miserable weather, little could be done in the way of manipulating the bees, but the tent was always filled with visitors, who attentively listened to the instructive lectures on Beekeeping which were constantly being given, and who showed by the questions they asked, and by their general interest in the art, that such an exhibition was well worthy of a place in the Society's Yard.

The Fish, in a neighbouring tent, consisted of trout, char, and *salmo fontinalis* (American brook-trout), bred by the exhibitor, and shown in separate tanks; some of this year's hatching and some about eighteen months old. There were also specimens of fish-hatching apparatus.

No doubt a great deal more ought to be done in the way of fish-culture in England than there is at present, and many a stream capable of growing good trout is neglected because it is small; whereas in a brook not a yard wide, trout will grow to 2 lbs. and 3 lbs. weight, if they have a fair chance given them and plenty of food, the best of which is fresh-water shrimps and snails, and in such brooks these generally abound.

In conclusion, I will say that although there is much really good and substantial work done, yet there is a growing tendency amongst machine-makers of all classes, owing to competition, to cheapen their work at the risk of efficiency. This is to a great extent the fault of their customers, who *will* buy the cheapest thing, forgetting that it is the dearest in the end; and so brasses are lightened, inferior metal used, and if it were possible to cast an engine with steam up, no doubt it would be done. Both makers and buyers would do well to adopt as their standard the workmanship and design shown by the best locomotive engineers, and not give way to shoddy, but keep up the quality of English productions, which in the long run will be the only way to retain our share of the trade of the world. This everywhere is now being most seriously threatened, not only by foreign countries putting prohibitive import duties on English machinery, but by developing their own iron-works, and training workmen who so far seem more amenable to reason than ours,—more thrifty, and consequently able to live well on much lower wages than many English workmen would starve on.

There are two facts, I learn from good authorities, affecting both farmers and manufacturers, which it may not be out of place to notice. The carriage of certain implements is less from England to America than it is to Ireland; and from some if not all ports, foreign cattle are carried inland at a cheaper rate than English cattle would be by the same or any train. This may be owing somewhat to the disturbed state of commerce; and when things right themselves, as now happily there is every prospect of their doing, we may hope that general prosperity will abolish such anomalies.

THE WORKING DAIRY.

One of the most interesting sights in the whole yard was the Working Dairy, under the management of Mr. Allender, of the Aylesbury Dairy Company, who, at the request of the Society, sent a collection of the best and newest machines employed by them, and fully showed their use by keeping them in constant work.

Several improvements suggested by the experience of Bristol and Kilburn were made in the arrangement of the Dairy. At one end was one of Marshall and Son's six-horse-power vertic engines, which drove a shaft running the length of the buildin supplied steam for heating water, and for driving a small engin attached to the cooling apparatus. Along one side and end, under the projecting roof, the public could stand, and the remaining side was provided with raised seats, so that those people who were specially interested could, on payment of a shilling, comfortably watch the processes, obtain information from the attendants, or instruction from the frequent lectures and explanations given by a competent person told off for the purpose, who thus supplied a want much felt on former occasions.

The improved systems of setting milk, viz., Swartz and Cooley, which have been before described in the 'Journal,' here clearly showed their superiority over the old flat-pan system; the Cooley, in Mr. Allender's opinion, being very suitable for small dairies, but for large concerns the Swartz is preferable. The water in the tanks was kept at about 40° by means of a cooling machine, such as is common in breweries, the low temperature being obtained by the evaporation of ether, pumped through pipes fixed in the tanks.

There was nothing special to record about the churns or butter workers.

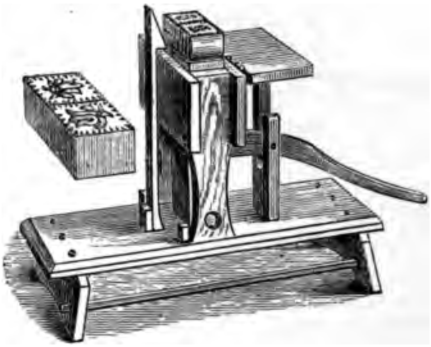
In buying large quantities of milk it is practically found to be impossible to get accurate results by measuring, so a machine has been invented by Mr. Allender for weighing it, by which means the quantity to an ounce is quickly and surely known. It consists of a weighing-table about 3 feet 6 inches square; on this are two A-frames, between which is supported, on trunnions, a copper tank, holding 35 gallons, or about 3 cwt. of milk. In one half of this is fitted a wire strainer, 80 meshes to the inch, through which the milk is poured. The tank being full, the contents are weighed, a catch is released, and the whole tipped up into a tank on the floor, from whence it is used as required.

Another new machine is the Aylesbury Dairy Company's Patent Butter-mixer, which has several uses—as mixing salt with butter, and washing salt out of butter—but its chief purpose is for mixing butyroseter, or the new butter preservative, with the butter to be so treated. It consists of two fluted rollers of wood, through which the butter passes into a pug mill below, the knives of which are of wood and can readily be taken out and cleaned; the machine is driven by power, and is capable of getting through a large amount of work in a short time.

Two Centrifugal Separators (Laval's patent) were also shown at work and were fully described in last year's 'Journal,'—most ingenious machines, but about the utility of which a good deal of doubt still exists, nor is it at all certain that the cream does not undergo some important molecular change from the centrifugal force to which it is subjected.

To obtain the best price for butter, not only should it be properly made, but cleanly and tastefully put before the purchaser, and in this latter respect many makers are most deficient, and the price of otherwise good butter is often diminished by the slovenly way in which it is sent to market. To simplify and ensure uniformity in this process, a simple machine on the principle of a brick-press is used, which any one can easily work. It will make pound or half-pound pats, which are turned out with the greatest uniformity and rapidity.

Fig. 17.—*Butter-presser.*



Much skill is required in neatly making it up by hand, and the exquisite way in which it was weighed into pounds, and made up by the neat-fingered dairymen, each pound wrapped in a piece of linen and slipped into a basket (like those in which strawberries are sold) just to fit it, must have taught a good lesson, not only to many a North-country dairymaid, but to many a lady as well. Judging from the quantity of specimen pats sold, and from the continuous interest shown in the Dairy from the beginning to the end of the Show, by people who were evidently not merely sight-seers, but anxious and eager to learn, the Society may well congratulate itself in having done no little good, in an educational point of view, in this most important but greatly neglected branch of British farming—that of butter-making.

No cheesemaking was done in the Yard, the process being too long and too delicate a one to be properly shown and explained in the bustle of a Show; so all the energy of Mr. Allender and his assistants was directed to butter. Too much praise cannot be bestowed on them, one and all, for the thorough way in which the work was done; nor on the Aylesbury Dairy Company, for so well responding to the wish of the Society in carrying out such an exceedingly instructive exhibition, and one which should form a portion of every future Show.

SUMMARY

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21. Utilisation of Waste Substances and Econom
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Robert Scott Burn, Consulting Farm Archi

22. The Management of a Shorthorn Herd. By

23. Laying down Land to Grass. By James
Clapham Park, Bedfordshire .. ..

24. Report on the Studs and Breeds of Horses
J. Collins, Principal Veterinary Surgeon

25. Report on the Cattle Disease in the Island o
Charles Heidenstam, M.D., District Me
Larnaca, Chief Inspector of Cattle Disea

26. The Sources of Supply of the Manchester Fr
Markets. By John Page .. .. ..

27. The Cumberland and Westmoreland Farm-
1880. By Herbert J. Little, of Coldham

28. On a New Method of Testing Milk.
Voelcker, F.R.S. .. ..

29. On the Composition of Ewes' Milk. B
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30. On the Composition of Goats' Milk. By
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31. Report of the Senior Steward of Live-St
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32. Report on Live-Stock at Carlisle. By Fi
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33. Report of the Senior Steward of Implem
Frankish, of Limber Magna, Ulceby, Linco

34. Report on the Exhibition and Trials of Implem
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APPENDIX.

List of Officers of the Royal Agricultural Society of England, 1880.
Standing Committees for 1880.
Report of the Council to the General Meeting, May 22, 1880.
Half-yearly Cash Account from 1st January to 30th June, 1880.
List of Stewards and at Carlisle.
Agricultural Educatio
Memoranda of Meeti tions, &c.
Members' Veterinary a
Members' Botanical and

London: Printed by William Clowes and Son

Royal Agricultural Soc

1880–81.

President.

THE DUKE OF BED

Year when Elected.

Trustees.

1879 H.R.H. The Prince of Wales, K.G., *Mar*
1855 Acland, Sir Thomas Dyke, Bart., M.P., *S*
1857 Bridport, General Viscount, *Cricket St. T*
1850 Chesham, Lord, *Latimer*, *Chesham*, *Bucks.*
1863 Kingscote, Colonel, M.P., *Kingscote*, *Wotton*
1868 Lichfield, Earl of, *Shugborough*, *Staffordshi*
1854 Macdonald, Sir Archibald Keppel, Bt., *Wo*
1860 Marlborough, Duke of, K.G., *Blenheim Par*
1839 Portman, Viscount, *Bryanston*, *Blandford*, *D*
1856 Powis, Earl of, *Powis Castle*, *Welshpool*, *Mont*
1858 Rutland, Duke of, K.G., *Belvoir Castle*, *Gran*
1861 Wells, William, *Holmewood*, *Peterborough*, *N*

Vice-Presidents.

1861 Cathcart, Earl, *Thornton-le-Street*, *Thirsk*, *York*
1839 Chichester, Earl of, *Stanmer Park*, *Lewes*, *Suss*
1861 Dent, J. D., *Ribston Hall*, *Wetherby*, *Yorkshire.*
1867 Devonshire, Duke of, K.G., *Holker Hall*, *Lancas*
1847 Eversley, Viscount, *Heckfield Place*, *Winchfield*,
1848 Gibbs, Sir Brandreth, *Halfmoon Street*, *Piccadill*
1858 Kerrison, Sir Edward C., Bart., *Brome Hall*, *Sco*
1848 Lawes, John Bennet, *Rothamsted*, *St. Albans*, *He*
1852 Richmond and Gordon, Duke of, K.G., *Goodwood*,
1872 Skelmersdale, Lord, *Lathom Hall*, *Ormskirk*, *La*
1859 Vernon, Lord, *Sudbury Hall*, *Derby.*
1855 Wynn, Sir Watkin Williams, Bart., M.P., *Wynnsta*

Other Members of Council.

*1858 Amos, Charles Edwards, 5, *Cedars Road*, *Clapha*
*1877 Arkwright, J. H., *Hampton Court*, *Leominster*, *H*
1880 Ashworth, Alfred, *Poynton*, *Cheshire.*
1875 Aveling, Thomas, *Rochester*, *Kent.*
1875 Aylmer, Hugh, *West Dereham*, *Stoke Ferry*, *Norfol*
*1863 Bowly, Edward, *Siddington House*, *Cirencester*, *Gl*
1861 Cantrell, Charles S., *Riding Court*, *Datchet* (*Bu*
1874 Chandos-Pole-Gell, H., *Hopton Hall*, *Wirksworth*
1878 Davies, David Reynolds, *Agden Hall*, *Lymm*, *Ch*
*1860 Druce, Joseph, *Eynsham*, *Oxford.*
*1868 Edmonds, William John, *Southrop*, *Lechlade*, *Glo*
*1871 Egerton, Hon. Wilbraham, M.P., *Rostherne Man*
1873 Evans, John, *Uffington*, *Shrewsbury*, *Salop.*
1876 Feversham, Earl of, *Duncombe Park*, *Helmsley*, *Yo*

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* Those Members of the Council whose names are prefix
by rotation in July, but are eligible for re-election in May.

1865 | **Lopes**, Sir **Massey**, Bart., M.P., *ristow, Roborough, Devo*
1871 | **McIntosh, David**, *Havering Park, Romford, Essex.*
1874 | **Martin, Joseph**, *Highfield House, Littleport, Isle of Ely, C*
*1879 | **Neville, Robert**, *Butleigh Court, Glastonbury, Somersetsh*
*1878 | **Odams, James**, *The Grange, Bishop Stortford, Herts.*
1857 | **Pain, Thomas**, *The Grove, Basingstoke, Hants.*
*1861 | **Randell, Charles**, *Chadbury, Evesham, Worcestershire.*
1875 | **Ransome, Robert Charles**, *Ipswich, Suffolk.*
1867 | **Ravensworth**, Earl of, *Ravensworth Castle, Durham.*
*1871 | **Rawlence, James**, *Bulbridge, Wilton, Salisbury, Wilts.*
1869 | **Ridley**, Sir **M. White**, Bart., M.P., *Blagdon, Cramlington,*
1875 | **Russell, Robert**, *Horton Court Lodge, Dartford.*
*1874 | **Sanday, George Henry**, *Wensley House, Bedale, Yorkshi*
*1878 | **Sheraton, William**, *Broom House, Ellesmere, Salop.*
*1856 | **Shuttleworth, Joseph**, *Hartsholme Hall, Lincoln.*
1874 | **Spencer**, Earl, K.G., *Althorpe, Northampton.*
*1875 | **Stratton, Richard**, *The Duffryn, Newport, Monmouthshi*
*1874 | **Turbervill**, Lieut.-Col. **Picton**, *Ewenny Priory, Bridgen*
1845 | **Turner, George**, *Great Bowley, Tiverton, Devonshire.*
1871 | **Turner, Jabez**, *Norman Cross, Yaxley, Huntingdonshire.*
1871 | **Wakefield, William H.**, *Sedgwick, Kendal, Westmorla*
*1870 | **Welby-Gregory**, Sir **William Earle**, Bart., M.P.,
Grantham, Lincolnshire.
*1870 | **Whitehead, Charles**, *Barming House, Maidstone, Kent.*
1865 | **Wilson, Jacob**, *Woodhorn Manor, Morpeth, Northumberla*
*1878 | **Wise, George**, *Woodcote, Warwick.*

Secretary and Editor.

H. M. JENKINS, 12, *Hanover Square, London,*

Consulting Chemist—Dr. Augustus V cker, F.R.S., 12, *Hanov*

STANDING COMMITTEES FOR 1880.

Finance Committee.

Kingscote, Colonel (Chairman).
Bridport, General Viscount.
Ridley, Sir M. White, Bt.
Davies, D. R.
Frankish, W.
Randell, Charles.
Shuttleworth, J.

House Committee.

The President.
Chairman of Finance Committee.
Bridport, General Viscount.
Gibbs, Sir Brandreth.
Cantrell, C. S.
Kingscote, Colonel.

Journal Committee.

Dent, J. D. (Chairman).
Cathcart, Earl.
Welby-Gregory, Sir W. E., Bt.
Ridley, Sir M. White, Bt.
Chandos-Pole-Gell, H.
Frankish, W.
Hemsley, J.
Howard, J.
Jones, J. Bowen.
Kingscote, Colonel.
Ransome, R. C.
Turbervill, Lieut.-Col.
Wells, W.
Whitehead, Charles.
Wise, G.

Chemical Committee.

Wells, William (Chairman).
Bedford, Duke of.
Lichfield, Earl of.
Vernon, Lord.
Macdonald, Sir A. K., Bart.
Welby-Gregory, Sir W. E., Bt.
Arkwright, J. H.
Aveling, T.
Carruthers, W.
Davies, D. R.
Dent, J. D.
Howard, C.
Jones, J. Bowen.
Lawes, J. B.
Neville, R.
Turbervill, Lieut.-Col.
Voelcker, Dr. A.
Wakefield, W. H.
Warren, R. A.
Whitehead, Charles.

Seeds and Plant-Diseases Committee.

Vernon, Lord.
Welby-Gregory, Sir W. E., Bt.
Gibbs, Sir Brandreth.
Arkwright, J. H.
Carruthers, W.
Frankish, W.
Jones, J. Bowen.
Turbervill, Lieut.-Col.
Voelcker, Dr.
Whitehead, Charles.

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Egerton, Hon. Wilbraham (Chairman).
Cathcart, Earl.
Bridport, General Viscount.
Ridley, Sir M. White, Bt.
Gibbs, Sir Brandreth.
Brown, Professor.
Chandos-Pole-Gell, H.
Davies, D. R.
Duguid, W.
Fleming, George.
Foster, S. P.
Gorringe, H.
Greenfield, Dr. Wm. Smith.
Harpley, M. J.
Kingscote, Colonel.
Odams, James.
Sanday, G. H.
Sanderson, Dr. J. Burdon.
Simonds, Professor.
Stratton, R.
Wakefield, W. H.
Wells, William.
Wilson, Jacob.

Stock-Prizes Committee.

Chandos Pole-Gell, H. (Chairman).
Bridport, Gen. Visct.
Gibbs, Sir Brandreth.
Arkwright, J. H.
Aylmer, H.
Bowly, Edward.
Davies, D. R.
Evans, John.
Frankish, W.
Gorringe, H.
Hemsley, J.
Howard, C.
McIntosh, D.
Pain, T.
Sanday, G. H.
Sheraton, W.
Simonds, Prof.
Stratton, R.
Torr, J.
Turner, Geo.
Wakefield, W. H.
Wilson, Jacob.
Wise, G.
The Stewards of Live Stock.

Implement Committee.

Bridport, Gen. Viscount.
Vernon, Lord.
Gibbs, Sir Brandreth.
Anderson, W.
Aveling, T.
Frankish, W.
Hemsley, J.
Howard, C.
Howard, J.
Jones, J. Bowen.
Martin, J.
Neville, R.
Ransome, R. C.
Rich, W. E.
Sanday, G. H.
Sheraton, W.
Shuttleworth, Joseph.
Stratton, R.
Turbervill, Lieut.-Col.
Turner, Jabez.
Whitehead, Charles.
Wilson, Jacob.
The Stewards of Implements.

General Carlisle Committee.

Kingscote, Colonel. (Chairman).
Bridport, Gen. Viscount.
Chesham, Lord.
Skelmersdale, Lord.
Egerton, Hon. W.
Gibbs, Sir Brandreth.
Aveling, T.
Aylmer, H.
Bowly, E.
Cantrell, Charles S.
Carlisle, Mayor of.
Chandos-Pole-Gell, H.
Davies, D. R.
Frankish, W.
Foster, S. P.
Howard, C.
Hemsley, J.
James, Captain W. E.
Jones, J. Bowen.
McIntosh, D.
Martin, J.
Pain, T.
Randell, Charles.
Ransome, R. C.
Rawlence, J.
Russell, R.
Sanday, G. H.
Shuttleworth, J.
Stephenson, Christopher.
Stratton, R.
Turbervill, Lieut.-Col.
Turner, Jabez.
Wakefield, W. H.
Wells, W.
Whitehead, Charles.
Wilson, Jacob.
Wood, George.

Show-Yard Contracts Committee.

Wilson, Jacob (Chairman).
Gibbs, Sir Brandreth.
Amos, C. E.
Aveling, T.
Chandos-Pole-Gell, H.
Frankish, W.
Hemsley, J.
Howard, C.
Randell, Charles.
Sanday, G. H.
Shuttleworth, Joseph.
Stratton, R.

Committee of Selection.

Cathcart, Earl.
Bridport, Gen. Visct.
Skelmersdale, Lord.
Chandos-Pole-Gell, H.
Hemsley, J.
Howard, C.
Turbervill, Lieut.-Col.

And the Chairmen of the Standing Committees.

Education Committee.

Dent, J. D. (Chairman).
Bedford, Duke of.
Aveling, T.
Jones, J. Bowen.
Neville, R.
Kingscote, Colonel.
Turbervill, Lieut.-Col.
Voelcker, Dr.
Whitehead, Charles.
Wise, G.

Cattle Plague Committee.

The whole Council.

⁂ The President, Trustees, and Vice-Presidents are **Members** ***ex officio*** of all Committees.

Royal Agricultural Society of England.

GENERAL MEETING,

12, Hanover Square, Thursday, December 11th, 1879.

REPORT OF THE COUNCIL.

In presenting the usual Half-yearly Report to the General Meeting in December, the Council have to express their satisfaction at the remarkably large number of Governors and Members who have been elected during the year; but at the same time they must express their regret and disappointment that the International Exhibition at Kilburn has resulted in a serious drain upon the funded capital of the Society.

During the year 1879, the number of Governors and Members has been increased by the election of 4 Governors and 1285 Members, and diminished by the death of 3 Governors and 90 Members, and the removal of 96 Members from resignation or by order of the Council.

The Society now consists of:—

82	Life Governors,
71	Annual Governors,
2619	Life Members,
5099	Annual Members,
20	Honorary Members,

making a total of 7891, and showing an increase of 1094 Members during the current year.

The Council have the pleasure of announcing that the Prince of Wales having graciously expressed a desire of taking part in the proceedings of the Society as a Member of Council, His Royal Highness has been unanimously elected a Trustee of the Society.

By the end of this year the funded capital of the Society will have been reduced by the sum of 14,000*l.*, of which nearly

12,000*l.* has been required to meet the deficit in the receipts at the Kilburn Exhibition, while the balance has been devoted to the building of the new laboratory and to the purchase of plant and materials for the Carlisle Meeting next year. The funded property of the Society at the end of the year will stand at 12,430*l.* 7*s.* 0*d.* New Three per Cents., and the balance of the current account in the hands of the Bankers on the 1st inst. was 1895*l.* 19*s.* 6*d.*, which, however, is not sufficient to meet outstanding claims connected with the London Meeting.

The half-yearly statement of accounts to the 30th of June last has been examined and approved by the Society's auditors and accountants, and has been published for the information of the Members in the last number of the 'Journal.'

In their Report to the Annual General Meeting held last May, the Council described the special features which the London Meeting would include; and the programme then presented was duly carried out, though under the most unfavourable circumstances as regards weather. The Kilburn Exhibition was certainly the largest and most varied Agricultural Show hitherto held; and amongst the novel features which specially attracted attention may be mentioned the International Dairy, the Comparative Loan Collection of Ancient and Modern Farm Implements, the Railway Waggons for the Conveyance of Fresh Provisions, and the Competing Plans of Farm Buildings. The Foreign Exhibits of Stock and Implements, although not numerous, were generally characteristic and interesting. The Live Stock department attained unprecedented dimensions; and the Council rejoice to add that owing to the precautions taken, and to the vigilance of a most efficient staff of Veterinary Inspectors, no case of Contagious or Infectious Disease appeared amongst any of the animals. Notwithstanding the very inclement weather, the proportion of animals affected with ordinary ailments, in comparison with the number exhibited, was reported as not so great as in the average of years.

The Presidency of the Prince of Wales, the visit of Her Majesty the Queen and of nearly every member of the Royal Family; the attendance of an unusually large number of Members of the Society; and the admission of about 200,000 people by payment at the turnstiles or by Season Tickets are sufficient indications of the general interest taken in the London Exhibition.

The Council refer the Members to the several reports on the different departments of the London Exhibition, published in the last number of the 'Journal,' from a perusal of which some idea of the magnitude and variety of that Exhibition, as well as of the difficulties under which it was held, may be gained by those who were unable to see it.

The Council have great satisfaction in reporting that the establishment of the new laboratory has already been eminently successful in encouraging the Members to send samples of purchased manures and feeding stuffs to Dr. Voelcker for analysis. Since the opening of the laboratory last March up to the beginning of the current month, the number of samples sent to Dr. Voelcker for analysis was 843, being 296 more than those sent during the corresponding period of the previous year.

The experiments at Woburn are being carried out on the same plan as hitherto, and a full report of the results obtained this year will be published in the forthcoming volume of the 'Journal.' Notwithstanding the exceptionally unfavourable season, the Council are of opinion that the comparison of the produce obtained by the use of different manures will be both interesting and useful to the Members of the Society.

Dr. Voelcker's Quarterly Reports on the adulteration of manures and feeding-stuffs show, that although the efforts of the Society have tended to the abatement of these practices to an appreciable extent, there is still great room for improvement. The want of ordinary firmness shown by those who, after putting the Society's Consulting Chemist and others to great trouble and correspondence in the investigation of the cases they bring forward, decline at the last to furnish the means of making them public, is one of the great difficulties with which the Council have now to contend.

The magnitude of the Implement Show at Kilburn has again drawn the attention of the Council to the desirability of curtailing this department of the Society's Country-meetings. They have therefore resolved that the maximum size of stands be 150 feet, and that the Implement Committee be empowered to decide the space alloted to each Exhibitor, and to disqualify any of his proposed exhibits; and that the charge for space in the miscellaneous department be doubled.

The Carlisle Local Committee are co-operating with the Council in order to make the meeting next year as useful and as attractive as possible. The Local Committee have offered Prizes in four classes for the best managed farms in the Counties of Cumberland and Westmoreland and in the Haltwhistle Union of the County of Northumberland, and seventeen entries have been received.

In addition to the Prizes for Live Stock which will be offered by the Society as usual, the Carlisle Local Committee propose to offer Prizes for Hunters, Hackneys, Coach-horses, Ponies, Galloway Cattle, Dairy Cows, and Butter.

The Council have decided that the Judges of Implements at Carlisle shall be empowered to award gold and silver medals to any implements or machines for the cultivation of the land by steam or other mechanical force, which in the opinion of the Stewards and Judges are new inventions, and have not been previously submitted to trial by the Society.

The Carlisle Meeting will commence on Monday, July 12th, and close on Friday, July 16th.

The new arrangement with the Governors of the Royal Veterinary College continues to work satisfactorily, and the Council would again call the attention of the Members to the valuable reports by the Professors of the College on the principal cases which have come under their notice. These reports are published in the Proceedings of the Council-meetings in the Agricultural Newspapers.

The experiments on quarter-evil and allied diseases are still being carried on at the Brown Institution; but the Director of the Institution finds great difficulty in procuring cases at a sufficiently early period of the disease. The Council therefore hope that any outbreak of quarter-evil or splenic apoplexy may be at once made known by telegraph to Dr. Greenfield, the Brown Institution, Wandsworth Road.

In consequence of the numerous applications which Professor Simonds continues to receive for copies of his paper on sheep-rot, published originally in 1862, in the 23rd volume of the 'Journal,' the Council have resolved to re-publish it as a pamphlet, considering that after the wet season of this year, sheep-rot is likely to be more prevalent in the country than usual.

Six specimens of wheat have been forwarded for competition, for the Prizes offered by the Society for the best new variety: these have each been divided into four lots and forwarded to four Members of the Society, who have agreed to grow the samples in accordance with the conditions laid down. Samples of the corn and straw have also been retained for comparison with the new crop.

Twenty-three candidates from four schools were entered to compete for the Society's Junior Scholarships; and the result of the examination was as follows:—

1st. R. P. CHOPE, Devon County School.
2nd. B. FURNIVALL, Surrey County School.
3rd. J. RIGBY, Sandbach Grammar School.
4th. T. LEESE, Sandbach Grammar School.
5th. G. L. HASLEHURST, Surrey County School.
6th. C. S. BRIMLEY, Bedford County School.
7th. A. E. KING, Surrey County School.

During the past year twelve candidates also competed for the Society's Senior Certificates and Prizes. Of these, three were successful in gaining first-class certificates, and the remainder failed in some branch of study. On the whole the Council see no reason to regret the course they are pursuing in offering these prizes and scholarships, but they are by no means satis- with the number of competitors for scholarships. If Masters of Schools were aware of the advantages offered, viz.: the scholarship of 20*l.*, the examination conducted at their own schools, with no trouble or expense to themselves,—the Council believe that they would receive more applications; and that a more general attempt would be made in country schools to teach the principles of Agriculture, and the elements of Chemistry, Mechanics, and Mensuration.

By order of the Council,

H. M. JENKINS, *Secretary.*

Royal Agricultural Society of England.

1880.

DISTRIBUTION OF MEMBERS OF THE SOCIETY AND OF MEMBERS OF COUNCIL.

Districts.	Counties.	Number of Members.	Number in Council.	Members of Council.
A.	Bedfordshire	138	2	C. Howard; James Howard.
	Buckinghamshire	107	2	Lord Chesham, T.; C. S. Cantrell.
	Cambridgeshire	101	1	J. Martin.
	Essex	272	1	D. McIntosh.
	Hertfordshire	146	2	J. B. Lawes, V.P.; J. Odams.
	Huntingdonshire	48	2	Jabez Turner; W. Wells, T.
	Middlesex	295	1	Sir Brandreth Gibbs, V.P.
	Norfolk	329	4	H.R.H. the Prince of Wales, K.G., T.; Earl of Leicester; Hugh Aylmer; Robert Leeds.
	Oxfordshire	147	2	Duke of Marlborough, T.; J. Druce.
	Suffolk	175	2	Sir E. C. Kerrison, V.P.; R. C. Ransome.
		1758	19	
B.	Cumberland	162	1	S. P. Foster.
	Durham	125	1	Earl of Ravensworth.
	Northumberland	152	2	Sir M. White Ridley; Jacob Wilson.
	Westmoreland	64	1	W. H. Wakefield.
		503	5	
C.	Derbyshire	143	2	Lord Vernon, V.P.; H. Chandos-Pole-Gell.
	Leicestershire	99	1	Duke of Rutland, T.
	Lincolnshire	205	3	Sir W. Earle Welby-Gregory; W. Frankish; J. Shuttleworth.
	Northamptonshire	130	1	Earl Spencer.
	Nottinghamshire	158	1	J. Hemsley.
	Rutland	13		
		748	8	

DISTRIBUTION OF MEMBERS OF THE SOCIETY—*continued.*

Districts.	Counties.	Number of Members.	Number in Council.	Members of Council.
D.	Berkshire	145	1	Colonel Loyd Lindsay.
	Cornwall	52		
	Devonshire	122	3	Sir T. D. Acland, T.; Sir M. Lopes; G. Turner.
	Dorsetshire	70	1	Viscount Portman, T.
	Hampshire	154	3	Viscount Eversley, V.P.; Sir A. K. Macdonald, T.; T. Pain.
	Kent	395	3	T. Aveling; R. Russell; C. Whitehead.
	Somersetshire	165	2	Visct. Bridport, T.; R. Neville.
	Surrey	153	1	C. E. Amos.
	Sussex	162	3	Earl of Chichester, V.P.; Duke of Richmond and Gordon, V.P.; H. Gorringe.
	Wiltshire	111	1	J. Rawlence.
		——1529	— 18	
E.	Yorkshire	366	4	Earl Cathcart, V.P.; Earl of Feversham; J. D. Dent, V.P.; G. H. Sanday.
F.	Gloucestershire	224	3	E. Bowly; W. J. Edmonds; Col. Kingscote, T.
	Herefordshire	97	1	J. H. Arkwright.
	Monmouthshire	49	1	R. Stratton.
	Shropshire	420	3	John Evans; J. Bowen Jones; W. Sheraton.
	Staffordshire	303	1	Earl of Lichfield, T.
	Warwickshire	222	1	George Wise.
	Worcestershire	176	1	C. Randell.
	South Wales	180	1	Lt.-Col. Picton Turbervill.
		——1671	— 16	
G.	Cheshire	212	3	Hon. W. Egerton; D. R. Davies; A. Ashworth.
	Lancashire	288	2	Duke of Devonshire, V.P.; Lord Skelmersdale, V.P.
	North Wales	191	2	Earl of Powis, T.; Sir W. W. Wynn, V.P.
		—— 691	— 7	
Scotland		99		
Ireland		103		
Channel Islands		10		
Foreign Countries		104		
Members without addresses		60		
		—— 376		

ROYAL AGRICULTUR

Dr.

Half-yearly Cash Accou

	£	s.	d.	£	s.	d.	£	s.
To Balance in hand, 25th June, 1879:—								
Bankers				1,804	4	5		
Secretary				0	13	1	1,804	17
To Sale of Stock				..	..	..	11,662	10
To Income:—								
Dividends on Stock				211	18	11		
Subscriptions:—								
Governors' Annual	15	0	0					
Members' Life-Compositions	1011	0	0					
Members' Annual	834	1	0	1,860	1	0		
Journal:—								
Advertisements..	52	15	3					
Sales	175	13	8					
Sale of 'Hints on Butter Making'..	41	5	10	269	14	9		
Chemical:—								
Laboratory Fees				189	1	6		
Veterinary:—								
Professional Fees				22	6	6		
Sundries				0	5	0		
Farm Inspection:—								
Entry Fees 1880				19	0	0		
Bristol Meeting				75	16	10		
Total Income				..	..	..	2,648	4
To London Exhibition				..	..	..	23,183	5
							£39,298	1

Balance-Sh

LIABILITIES.	£	s.	d.	£	s.	d.	£
To Capital:—							
Surplus, 25th June, 1879							33,744
Deduct Surplus of Expenditure over Income during the Half-year, viz.:—							
Expenditure	3,657	9	10				
Income	2,648	4	6				
	1,009	5	4				
Less half-year's interest and depreciation on Country Meeting Plant	271	11	10	1,280	17	2	15,339
London Exhibition:—							
Excess of Expenditure over Receipts				14,058	17	8	
							£18,404

TER, BALL, CROSBIE, GLEGG, & WELTON, *Accountants.*

SOCIETY OF ENGLAND.

FROM 25TH JUNE TO 31ST DECEMBER, 1879. Cr.

	£ s. d.	£ s. d.	£ s. d.
By Expenditure:—			
Establishment:—			
Salaries, Wages, &c.	692 10 0		
House:—Rent, Taxes, Repairs, &c.	345 4 4		
Office:—Printing, Postage, Stationery, &c.	279 12 6		
		1,317 6 10	
Journal:—			
Printing and Stitching	765 19 6		
Postage and Delivery	240 0 0		
Literary Contributions	280 14 0		
Woodcuts	102 18 6		
Advertising	3 12 6		
Reprint of No. 29	56 1 10		
Printing 'Hints on Butter Making'	23 15 9		
		1,473 2 1	
Chemical:—			
Salaries	327 10 0		
Erecting Laboratory, balance	77 19 0		
Petty Payments	40 0 0		
		445 9 0	
Veterinary:—			
The Brown Institution for Investigations to Christmas, 1879	125 0 0		
Professional Fees to Royal Veterinary College	48 19 11		
		173 19 11	
Botanical:—			
Consulting Botanist's Salary		50 0 0	
Education:—			
Printing	4 0 6		
Scholarships	140 0 0		
		144 0 6	
Subscriptions (paid in error) returned		3 0 0	
Stock:—Power of Attorney		0 11 6	
Bristol Meeting		50 0 0	
Total Expenditure		.. .. ..	3,657 9 10
By Country Meeting Plant		.. .. ..	1,771 6 9
By London Exhibition		31,765 6 11	
By Carlisle Meeting		1,401 3 2	
			33,166 10 1
			38,595 6 8
By Balance in hand, 31st December:—			
Bankers		682 13 4	
Secretary		20 17 4	
			703 10 8
			£39,298 17 4

31ST DECEMBER, 1879.

ASSETS.	£ s. d.	£ s. d.
By Cash in hand	703 10 8	
By New 3 per Cent. Stock 12,430*l.* 7*s.* 0*d.* cost*	11,677 17 1	
By Books and Furniture in Society's House	1,451 17 6	
By Country Meeting Plant	3,170 1 11	
		17,003 7 2
At debit of Carlisle Meeting	.. .. ..	1,401 3 2
		£18,404 10 4

* *Value at* 97 = 12,057*l.* 8*s.* 11*d.*

Mem.—The above Assets are exclusive of the amount recoverable in respect of arrears of Subscription to 31st December, 1879, which at that date amounted to 1109*l.*

Examined, audited, and found correct, this 1st day of March, 1880.

FRANCIS SHERBORN,
A. H. JOHNSON,
HENRY CANTRELL.
} *Auditors on behalf of the Society.*

ROYAL AGRICULTURAL

DR. YEARLY CASH ACCOUNT,

	£ s. d.	£ s. d.	£ s. d.
To Balance in hand, 1st Jan. 1879:—			
Bankers	. .	95 10 7	
Secretary	. .	105 3 0	200 13 7
To sale of Stock	. .	. .	13,652 10 0
To Income:—			
Dividends on Stock	. .	570 15 4	
Subscriptions:—			
Governors' Life Compositions	95 0 0		
Governors' Annual	370 0 0		
Members' Life-Compositions	2,777 0 0		
Members' Annual	4,805 3 0	8,047 3 0	
Journal:—			
Advertisements	175 13 8		
Sales	105 17 0		
Sale of 'Hints on Butter Making'	41 5 10	322 16 6	
Chemical:—			
Laboratory Fees	. .	189 1 6	
Farm-Inspection:—			
Entry Fees	. .	19 0 0	
Establishment:—			
Rent	. .	100 0 0	
Veterinary:—			
Professional Fees	. .	46 3 0	
Sundries	. .	5 0	
Total Income	. .	. .	9,295 4 4
To Bristol Meeting	. .	171 0 10	
To London Exhibition	. .	38,802 4 4	38,973 5 2
			£62,121 13 1

SOCIETY OF ENGLAND.

FROM 1ST JANUARY TO 31ST DECEMBER, 1879. CR.

	£.	s.	d.	£.	s.	d.	£.	s.	d.
By Expenditure :—									
Establishment:—									
Salaries, Wages, &c.	1,385	0	0						
House: Rent, Taxes, Repairs, &c.	804	5	7						
Office: Printing, Postage, Stationery, &c.	677	1	1						
				2,866	6	8			
Journal :—									
Printing and Stitching	1,451	13	3						
Postage and Delivery	450	0	0						
Literary Contributions	564	19	0						
Woodcuts	168	13	0						
Advertising	3	12	6						
Reprint of No. 29	56	1	10						
Printing 'Hints on Butter Making'	23	15	9						
				2,718	15	4			
Chemical:—									
Grant for Investigations, 1878	200	0	0						
Salaries	599	13							
Petty Payments	40	0	0						
Erecting Laboratory	592	14	0						
Chemical Apparatus	300	0	0						
Furniture, &c.	81	18	6						
				1,814	5	6			
Veterinary:—									
The Brown Institution for Investigations, 1879	250	0	0						
Prizes and Medals	30	7	0						
Fees to Examiners	21	15	0						
Professional Fees to Royal Veterinary College	71	15	5						
				373	17	5			
Botanical :—									
Consulting Botanist's Salary	. .			100	0	0			
Education :—									
Fees to Examiners	52	10	0						
Printing	22	5	0						
Advertising	18	3	6						
Prizes	50	0	0						
Scholarships	140	0	0						
				282	18	6			
Subscriptions (paid in error) returned	. .			15	1	0			
Farm Inspection:—									
Advertising	. .			69	15	9			
Sundries	. .			35	5	5			
Total Expenditure	. .			. .			8,276	5	7
By Country Meeting Plant	. .			. .			1,803	17	9
By Bristol Meeting	. .			324	13	8			
London Exhibition	. .			49,622	2	3			
Carlisle Meeting	. .			1,401	3	2			
							51,347	19	1
By Balance in hand :—									
Bankers	. .			682	13	4			
Secretary	. .			20	17	4			
							703	10	8
							£62,131	13	1

Receipts.

Subscription from Mansion House
Donation from the Shorthorn Society
Admissions to Show-Yard by Payment
Admissions by Season Ticket
Admissions to Grand Stand
Sale of Catalogues
Printing Entries in Implement Catalogue
Advertisements in Stock Catalogue
Implement Exhibitors' Payments for Shedding
Non-Members' Fees for entry of Implements
Fees for entry of Live Stock
Fees for Horse Boxes and Stalls
Fees for entry of Cheese, Butter, Hops, &c.
Premiums for Supply of Refreshments
Premium for Cloak Rooms, Lavatories, &c.
Bath Chairs
Fines for Non-Exhibition of Live Stock
Sale of Trucks
Reference Number Fines
Sales of Butter

To Balance

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* Exclusive of Special Prizes: viz. Mansion House Committee, 1872l. 13s.; The Earl of Ell
lish Cart Horse Society, 75l.; The Clydesdale Horse Society, 50l.; Lord Waveney, 50l
ral Omnibus Company, 25l.; Breeders of Mules, 25l.; The Shorthorn Society, 25l.; Sussex
Longhorn Society, 52l. 10s.; The English Jersey Herd-Book Association, 50l.; Breeders

EXPENDITURE.

	£.	s.	d.	£.	s.	d.
SHOW-YARD WORKS:—						
To Timber and Joinery	10,792	0	7			
,, Ironmongery and Working Plant	936	19	4			
,, Paints and Glass	102	18	9			
,, Canvas, 3103*l.* 12*s.* 9*d*; Bedding, 28*l.* 1*s.* 3*d.*	3,131	14	0			
,, Oil Baize, 107*l.* 9*s.*; Cocoa Matting, 46*l.* 8*s.* 7*d.*; Felt, 389*l.* 7*s.* 2*d.*	543	4	9			
,, Lime, Bricks and Mortar, and Concrete Slabs	181	18	5			
,, Hurdles for Stock Sheds	609	13	3			
,, Coals	31	12	9			
,, Wages, 4,641*l.* 4*s.* 8*d.*; Railway Fares, Cab Hire, Carriage, &c., 305*l.* 2*s.* 9*d.*	4,946	7	5			
,, Horse Hire	426	3	7			
,, Postage, Stationery, Telegrams, and Office Fittings	76	15	2			
,, Cisterns, 78*l.* 16*s.*; Lavatory Fittings, 144*l.* 14*s.* 8*d.*; Turnstiles, 17*l.* 5*s.* 3*d.*	240	15	11			
,, Insurance, 21*l.* 7*s.* 6*d.*; Signals, 19*l.* 10*s.*	40	17	6			
,, Sundries	16	11	6			
,, Superintendent of Works, 1000*l.*; Surveyor, 402*l.* 15*s.*; Interest and Depreciation of Plant, 398*l.* 18*s.* 1*d.*	1,801	13	1			
Per Contra:—				23,879	6	0
By Auction Sales, 3477*l.* 18*s.* 10*d.*; Private Sales, 1,390*l.* 4*s.*	4,868	2	10			
,, Exhibitors and Purveyors	2,535	4	4			
,, Sundries	20	15	2			
,, Timber and Ironmongery sent to Carlisle	535	13	2			
,, Transfers to Permanent Plant	1,297	12	1			
				9,257	7	7
				14,621	18	5
Show-Yard:—Rent of Land, 1553*l.* 6*s.* 8*d.*; Rent of Cab Stand, 30*l.*	1583	6	8			
Drainage	1221	19	1			
Making roads, making up and levelling, burning ballast, materials (except Sleepers), team labour, &c.	2253	16	6			
Additional works, drainage, ballast, team labour, &c.	1034	5	10			
Commission on Works, and Railway fares	94	19	0			
Hurdles and Sleepers, 1605*l.* 1*s.* 1*d.*; Ballast and Tan, 147*l.* 1*s.* 6*d.*	1752	2	7			
Laying on and use of Water	1007	15	10			
Restoring Land after Show and making good Roads and Paths	297	4	3			
Continuous Fencing	179	16	6			
				9,425	6	3
Judges:—Implements, 113*l.* 13*s.*; Stock, 584*l.* 13*s.* 7*d.*; Foreign, 29*l.* 16*s.* 7*d.*; Butter and Cheese, 45*l.* 4*s.*; Bacon, Hops, and Cider, 41*l.* 18*s.* 6*d.*; Wool and Bees, 28*l.* 8*s.* 9*d.*; Farm Plans, 48*l.* 10*s.* Sewage Farms, 268*l.* 9*s.* 11*d.*; Market-garden Farms, 24*l.* 17*s.*				1,185	11	4
Consulting Engineers and Assistants				227	1	4
Inspectors:—Veterinary, 94*l.* 5*s.*; Shearing, 35*l.* 2*s.* 10*d.*				129	7	10
Police				1,158	1	8
Clerks and Assistants:—Bankers, 150*l.*; Post Office, 56*l.* 5*s.* 10*d.*; Secretary and Stewards, 265*l.* 10*s.* 3*d.*; Foreign Clerk and Interpreters, 170*l.* 10*s.*				642	6	1
Stewards' Expenses, 56*l.* 6*s.*; Assistant Stewards, 142*l.* 1*s.* 5*d.*				198	7	5
Superintendents of Stock and Implement Yards, 102*l.* 5*s.* 6*d.*; Foremen and Assistant-Foremen, 215*l.* 9*s.* 7*d.*				317	15	1
Superintending and Placing Old Implements, Superintending Produce Sheds, &c.				117	8	0
Yardmen, Foddermen, Grooms, Labourers, &c.				639	17	7
Index Clerk and Money Takers, 170*l.* 3*s.* 11*d.*; Money Changer, Doorkeepers, &c., 202*l.* 13*s.*				372	16	11
Commissionaires, 257*l.* 4*s.*; Boy Messengers, 8*l.* 15*s.* 3*d.*				265	19	3
Stewards' Hotel Expenses and Entertaining Foreign Visitors, 690*l.* 7*s.*; Journeys to Windsor, 12*l.* 14*s.*				703	1	0
Refreshments and entertainments in Show-yard				770	10	3
Lodgings for Officials, 87*l.* 12*s.*; Expenses of Secretary and Staff, 24*l.* 1*s.* 8*d.*				111	13	8
Furnishing, &c., H.R.H. the President's Tent, 422*l.* 5*s.*; Plants and Flowers for ditto and Members' Club, 195*l.* 4*s.* 6*d.*				617	9	6
Catalogues:—Implements, 1161*l.* 11*s.* 4*d.*; Stock, 1141*l.* 16*s.* 3*d.*; Awards, 176*l.* 18*s.*; Plan of Yard, 53*l.* 15*s.*; Commission on Sales, 89*l.* 5*s.*				2,623	5	7
Printing, 1644*l.* 2*s.* 4*d.*; Advertising and Bill Posting, 2819*l.* 1*s.*				4,463	3	4
Postage, Carriage, Stationery, Badges, &c.				259	1	8
Hay, 591*l.* 10*s.* 2*d.*; Straw, 989*l.* 2*s.* 1*d.*; Green Food, 812*l.* 12*s.* 6*d.*				2,393	4	9
Repairs, Insurance, and Carriage of Testing Machinery for Trials and for International Dairy				121	1	1
Horse and Carriage Hire				238	1	9
Milk and Cream, 62*l.* 2*s.*; Ice, 43*l.* 5*s.* 10*d.*, for International Dairy				105	7	10
Meat and Poultry, 59*l.* 10*s.* 7*d.*; Ice, 3*l.* 10*s.*, for trial of Meat Vans				63	0	7
Quarantine Expenses				123	10	7
Veterinary Medicines, 3*l.* 5*s.* 11*d.*; Baskets, 3*l.* 10*s.*; Oil Baize, 24*l.* 12*s.* 6*d.*				31	8	5
Organist and Hire of Organ, 8*l.* 8*s.*; Hire of Chairs, 35*l.* 17*s.* 4*d.*; Hire of Clock, 15*l.*				59	5	4
Corn and Seeds, 8*l.* 1*s.* 1*d.*; Digging Embankment, 25*l.*				33	1	1
Use of Engines and men, 28*l.* 1*s.* 1*d.*; Fire Brigade, 80*l.*; Carriage of Old Implements, 240*l.* 9*s.* 3*d.*				348	10	4
Prize Plates, 129*l.* 3*s.* 6*d.*; Rosettes, 34*l.* 8*s.* 10*d.*; Caps and Jackets, 30*l.* 7*s.* 8*d.*				194	0	0
Removing Cows for fear of Pleuro-Pneumonia, 50*l.*; Petty charges, 18*l.* 7*s.*				68	7	0
Clearing Yard after Show:—Wages, Horse Hire, &c.				134	12	2
Stock:—Prizes, 7388*l.**; Medals, 18*l.* 10*s.*				7,406	10	0
				£50,170	3	1

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of Norfolk and Suffolk Polled Cattle, 50*l.*; Breeders of Polled Angus and Aberdeen Cattle, 25*l.*; Goat Bree 28*l.*; Hop Growers and Hop Factors, 170*l.*; Perry and Cider, by M. Biddulph, Esq., M.P., 70*l.*; British - keepers' Association, 23*l.*

Carlisle Meeting, 1880.

ON MONDAY, THE 12TH OF JULY, AND FOUR FOLLOWING DA

SCHEDULE OF PRIZES.

I.—LIVE-STOCK PRIZES.

Reference Number in Certificates.	HORSES.	First Prize.	Second Prize.	T Pr
Class	STALLIONS.	£.	£.	£
1	Agricultural Stallion, four years old and upwards, *not qualified to compete as Clydesdale or Suffolk*	40	20	1
2	Agricultural Stallion, three years old, *not qualified to compete as Clydesdale or Suffolk*	30	20	1
3	Agricultural Stallion, two years old, *not qualified to compete as Clydesdale or Suffolk*	30	20	1
4	Clydesdale Stallion, four years old and upwards..	40	20	1
5	Clydesdale Stallion, three years old	30	20	1
6	Clydesdale Stallion, two years old	30	20	1
7	Suffolk Stallion, four years old and upwards ..	40	20	1
8	Suffolk Stallion, three years old	30	20	1
9	Suffolk Stallion, two years old	30	20	1
10	Thorough-bred Stallion, suitable for getting Hunters	50	25	1
11	*Thorough-bred Stallion, suitable for getting Hunters or Coach Horses	105	..	
	The Prize-winner must serve half-bred Mares in the County of Cumberland during the season 1881, at a fee not exceeding three guineas (groom's fee included); the horse to attend and remain during the whole of the season within the County, and to stand one day each week during the season at Carlisle, Wigton, Cockermouth, and Penrith; the Prize not to be paid until these conditions are complied with.			
12	Stallion, suitable for getting Coach Horses	25	15	1
13	Stallion, suitable for getting Hackneys, above 14 hands 2 inches and not exceeding 15 hands 2 inches	20	10	
14	Pony Stallion, above 13 hands 2 inches and not exceeding 14 hands 2 inches	15	10	

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* Offered by Members of the Cumberland Hunt.

Reference Number in Certificates. Class	HORSES—*continued.*	First Prize. £	Second Prize. £	Third Prize. £
	BROOD MARES AND FILLIES.			
15	Agricultural Mare and Foal, *not qualified to compete as Clydesdale or Suffolk*	30	20	10
16	Clydesdale Mare and Foal	30	20	10
17	Suffolk Mare and Foal	30	20	10
18	Mare, four years old or upwards	20	10	5
19	Agricultural Filly, three years old, *not qualified to compete as Clydesdale or Suffolk*	20	10	5
20	Clydesdale Filly, three years old	20	10	5
21	Suffolk Filly, three years old	20	10	5
22	Agricultural Filly, two years old, *not qualified to compete as Clydesdale or Suffolk*	20	10	5
23	Clydesdale Filly, two years old	20	10	5
24	Suffolk Filly, two years old	20	10	5
25	*Agricultural Filly, one year old	10	5	..
26	*Clydesdale Filly, one year old	10	5	..
27	Hunter Mare and Foal	30	20	10
28	Coaching Mare and Foal	20	10	5
29	Hackney Mare and Foal, above 14 hands 2 inches and not exceeding 15 hands 2 inches	20	10	5
30	Pony Mare and Foal, above 13 hands 2 inches and not exceeding 14 hands 2 inches	15	10	5
	AGRICULTURAL MARES, COLTS, AND GELDINGS. *Not qualified to compete as Clydesdale or Suffolk.*			
31	*Pair of Agricultural Horses, Mares or Geldings, four years old and upwards, not less than 16 hands high	20	10	5
32	*Gelding, four years old, not less than 16 hands high	15	10	5
33	*Gelding, three years old	15	10	5
34	*Gelding, two years old	15	10	5
35	*Agricultural Colt or Gelding, one year old	10	5	..
36	*Clydesdale Colt or Gelding, one year old	10	5	..
	HUNTERS.			
37	*Mare or Gelding, up to 15 stone, five years old and upwards	25	15	10
38	*Mare or Gelding, up to 12 stone, five years old and upwards	25	15	10
39	*Mare or Gelding, four years old	20	10	5
40	*Mare or Gelding, three years old	15	10	5
41	*Mare or Gelding, two years old	10	5	..
42	*Mare, Colt, or Gelding, one year old	10	5	..

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* **Offered by the Carlisle Local Committee.**

Reference Number in Certificates.	HORSES—*continued.*	First Prize.	Second Prize.	Third Prize.
Class		£.	£.	£.
	COACH HORSES.			
43	*Mare or Gelding, four years old and upwards, not less than 16 hands high	15	10	5
44	*Mare or Gelding, three years old	15	10	..
45	*Mare or Gelding, two years old	10	5	..
	HACKNEYS AND ROADSTERS.			
46	*Mare or Gelding, exceeding 15 hands, up to not less than 15 stone	20	10	5
47	*Mare or Gelding, exceeding 15 hands, up to not less than 12 stone	20	10	5
48	*Mare or Gelding, above 14 and not exceeding 15 hands, up to 15 stone	20	10	5
49	*Mare or Gelding, above 14 and not exceeding 15 hands, up to 12 stone	20	10	5
	PONIES.			
50	*Mare or Gelding, above 13 and not exceeding 14 hands	15	10	5
51	*Mare or Gelding, above 12 hands and not exceeding 13 hands	15	10	5
52	*Mare or Gelding, not exceeding 12 hands	10	5	..
	CATTLE,			
	(ALL AGES ARE CALCULATED TO 1ST JULY, 1880, inclusive.)			
	SHORTHORN.			
53	Bull, above three years old	30	20	15
54	Bull, above two and not exceeding three years old	25	15	10
55	Yearling Bull, above one and not exceeding two years old	25	15	10
56	Bull-Calf, above six and not exceeding twelve months old	20	15	10
57	Cow, in-milk or in-calf, above three years old ..	20	15	10
58	Heifer, in-milk or in-calf, not exceeding three years old	20	15	10
59	Yearling Heifer, above one and not exceeding two years old	20	15	10
60	Heifer-Calf, above six and under twelve months old	20	15	10
	†A Champion Prize, value £25, will be given for the best Shorthorn Bull in the Show.			

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* Offered by the Carlisle Local Committee.
† Offered by Mr. S. P. Foster.

Reference Number in Certificates.	CATTLE—*continued.*	First Prize.	Second Prize.	Third Prize.
Class		£.	£.	£.
	HEREFORD.			
61	Bull, above three years old	25	15	5
62	Bull, above two and not exceeding three years old	25	15	5
63	Yearling Bull, above one and not exceeding two years old	25	15	5
64	Bull-Calf, above six and not exceeding twelve months old	15	10	5
65	Cow, in-milk or in-calf, above three years old ..	20	10	5
66	Heifer, in-milk or in-calf, not exceeding three years old	15	10	5
67	Yearling Heifer, above one and not exceeding two years old	15	10	5
68	Heifer-Calf, above six and under twelve months old	15	10	5
	DEVON.			
69	Bull, above three years old	25	15	5
70	Bull, above two and not exceeding three years old	25	15	5
71	Yearling Bull, above one and not exceeding two years old	25	15	5
72	Bull-Calf, above six and not exceeding twelve months old	15	10	5
73	Cow, in-milk or in-calf, above three years old ..	20	10	5
74	Heifer, in-milk or in-calf, not exceeding three years old	15	10	5
75	Yearling Heifer, above one and not exceeding two years old	15	10	5
76	Heifer-Calf, above six and under twelve months old	15	10	5
	SUSSEX.			
77	Bull, above three years old	20	10	5
78	Bull, above two and not exceeding three years old	20	10	5
79	Yearling Bull, above one and not exceeding two years old	15	10	5
80	Cow, in-milk or in-calf, above three years old ..	20	10	5
81	Heifer, in-milk or in-calf, above two and not exceeding three years old	15	10	5
82	Yearling Heifer, above one and not exceeding two years old	15	10	5
	LONG-HORN.			
83	Bull, two years old and upwards	20	10	5
84	Bull, under two years old	15	10	5
85	Cow, in-calf or in-milk, three years old and upwards	20	10	5
86	Heifer, under three years old	15	10	5

Reference Number in Certificates.	CATTLE—*continued.*	First Prize.	Second Prize.	Thi Pri
Class		£	£	£
	JERSEY.			
87	Bull, two years old and upwards	20	10	5
88	Bull, under two years old	15	10	5
89	Cow, in-calf or in-milk, three years old and upwards	20	10	5
90	Heifer, under three years old	15	10	5
	GUERNSEY.			
91	Bull, above one year old	15	10	5
92	Cow, in-calf or in-milk, three years old and upwards	15	10	5
93	Heifer, not exceeding three years old	15	10	5
	NORFOLK AND SUFFOLK POLLED.			
94	Bull, two years old and upwards	15	10	5
95	Bull, not exceeding two years old	15	10	5
96	Cow, in-calf or in-milk, three years old and upwards	15	10	5
97	Heifer, under three years old	15	10	5
	AYRSHIRE.			
98	Bull, above two years old	20	10	5
99	Cow, in-calf or in-milk, above three years old ..	15	10	5
100	Heifer, not exceeding three years old	15	10	5
	POLLED GALLOWAY.			
101	*Bull, above three years old	20	10	5
102	*Bull, above three and not exceeding two years old	20	10	5
103	*Yearling Bull, above one and not exceeding two years old	15	10	5
104	*Cow, in-milk or in-calf, above three years old ..	20	10	5
105	*Heifer, in-milk or in-calf, above two and not exceeding three years old	15	10	[illegible]
106	*Yearling Heifer, above one and not exceeding two years old	15	10	[illegible]
	POLLED ANGUS, OR ABERDEEN.			
107	*Bull, two years old and upwards	20	10	
108	*Bull, not exceeding two years old	20	10	
[illegible]	*Cow, in-calf or in-milk, three years old and upwards	20	10	
[illegible]	*Heifer, under three years old	15	10	

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* Offered by the Carlisle Local Committee.

Reference Number in Certificates.	CATTLE—*continued.*	First Prize.	Second Prize.	Third Prize.
Class		£.	£.	£.
	DAIRY COWS.			
111	*Pair of Dairy Cows, of any breed or cross, in-milk, milking properties to be specially considered ..	20	10	5
112	*Cow of any breed or cross, in-milk, milking properties to be specially considered	10	5	..

The Jersey and Guernsey Cows entered as in-milk, and the Dairy Cows in Classes 111 and 112, must be milked dry on the evening of July 11, in the presence of an officer of the Society.

No Third Prize will be given unless at least Six Entries be exhibited, and no Second Prize will be given unless at least Three Entries be exhibited, except on the special recommendation of the Judges to the Stewards of Stock.

SHEEP.

Class		First Prize.	Second Prize.	Third Prize.
	LEICESTER.			
113	Shearling Ram	20	10	5
114	Ram of any other age	20	10	5
115	Pen of Five Shearling Ewes, of the same flock ..	15	10	5
	BORDER LEICESTER.			
116	Shearling Ram	20	10	5
117	Ram of any other age	20	10	5
118	Pen of Five Shearling Ewes, of the same flock ..	15	10	5
	COTSWOLD.			
119	Shearling Ram	20	10	5
120	Ram of any other age	20	10	5
121	Pen of Five Shearling Ewes, of the same flock ..	15	10	5
	LINCOLN.			
122	Shearling Ram	20	10	5
123	Ram of any other age	20	10	5
124	Pen of Five Shearling Ewes, of the same flock ..	15	10	5

* Offered by the Carlisle Local Committee.

Reference Number in Certificates.	SHEEP—*continued.*
Class	
	OXFORDSHIRE DOWN.
125	Shearling Ram .. ..
126	Ram of any other age .. ..
127	Pen of Five Shearling Ewes, of the same fl
	SOUTHDOWN.
128	Shearling Ram .. ..
129	Ram of any other age .. ..
130	Pen of Five Shearling Ewes, of the same fl
	SHROPSHIRE.
131	Shearling Ram .. ..
132	Ram of any other age .. ..
133	Pen of Five Shearling Ewes, of the same fl
	HAMPSHIRE AND OTHER SHORT-WOO BREEDS.
	Not qualified to compete as Southdown Shropshire.
134	Shearling Ram .. ..
135	Ram of any other age .. ..
136	Pen of Five Shearling Ewes, of the same fl
	CHEVIOT.
137	Shearling Ram .. ..
138	Ram of any other age .. ..
139	Pen of Five Shearling Ewes, of the same
	BLACK-FACED MOUNTAIN.
140	Shearling Ram .. ..
141	Ram of any other age .. ..
142	Pen of Five Shearling Ewes, of the same f
	HERDWICK.
143	Shearling Ram .. ..
144	Ram of any other age .. ..
145	Pen of Five Shearling Ewes, of the same
146	*Pen of Five Ewes of the same flock, wi Lambs, direct from the heaf or fell ..

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* Offered by the Right Hon. Lor

Reference Number in Certificates.	SHEEP—*continued.*	First Prize.	Second Prize.	Third Prize.
Class		£.	£.	£.
	LONK.			
147	Shearling Ram	10	5	3
148	Ram of any other age	10	5	3
149	Pen of Five Shearling Ewes, of the same flock ..	10	5	3
	KENTISH, ROMNEY MARSH, DEVON, AND OTHER LONG-WOOLLED BREEDS.			
	Not qualified to compete in any of the preceding classes of Long-woolled Sheep.			
150	Shearling Ram	10	5	..
151	Ram of any other age	10	5	..
152	Pen of Five Shearling Ewes, of the same flock ..	10	5	..
	No Third Prize will be given unless at least Six Entries be exhibited, and no Second Prize will be given unless at least Three Entries be exhibited, except on the special recommendation of the Judges to the Stewards of Stock.			
	PIGS.			
	LARGE WHITE BREED.			
153	Boar, above six months and not exceeding twelve months old	10	5	..
154	Boar, above twelve months old	10	5	..
155	Pen of Three Breeding Sow-Pigs of the same litter, above three and not exceeding six months old	10	5	..
156	Breeding Sow	10	5	..
	SMALL WHITE BREED.			
157	Boar, above six months and not exceeding twelve months old	10	5	..
158	Boar, above twelve months old	10	5	..
159	Pen of Three Breeding Sow-Pigs of the same litter, above three and not exceeding six months old	10	5	..
160	Breeding Sow	10	5	..

Reference Number in Certificates.	PIGS—*continued.*	First Prize.	Second Prize.	Third Prize.
Class		£.	£.	£.
	SMALL BLACK BREED.			
161	Boar, above six months and not exceeding twelve months old	10	5	..
162	Boar, above twelve months old	10	5	..
163	Pen of Three Breeding Sow-Pigs of the same litter, above three and not exceeding six months old	10	5	..
164	Breeding Sow	10	5	..
	BERKSHIRE BREED.			
165	Boar, above six months and not exceeding twelve months old	10	5	..
166	Boar, above twelve months old	10	5	..
167	Pen of Three Breeding Sow-Pigs of the same litter, above three and not exceeding six months old	10	5	..
168	Breeding Sow	10	5	..
	OTHER BREEDS. *Not eligible to compete in any of the preceding Classes.*			
169	Boar, above six months and not exceeding twelve months old	10	5	..
170	Boar, above twelve months old	10	5	..
171	Pen of three Breeding Sow-Pigs of the same litter, above three and not exceeding six months old ..	10	5	..
172	Breeding Sow	10	5	..

No Second Prize will be given unless at least Three Entries be exhibited, except on the special recommendation of the Judges to the Stewards of Stock.

BUTTER.	First Prize.	Second Prize.	Third Prize.	Fourth Prize.	Fifth Prize.
	£	£	£	£	£
*†Six Pounds of Fresh Butter (open to makers only)	6	5	4	3	2
*One Firkin of Butter (open to makers only) ..	6	5	4	3	2

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* Offered [illegible] the Carlisle Local Committee.

† The first, second, and third prizes in this class are offered in plate by J. A. Wheat-[illegible] Carlisle.

SPECIAL PRIZES.

STEAM CULTIVATING MACHINERY.

SPECIAL GOLD AND SILVER MEDALS.

1. The Judges are empowered to award Gold and Silver Medals to any Implements and Machines for the cultivation of the land by steam or other mechanical force, which, in the opinion of the Stewards and Judges, are new inventions, and have not been previously submitted to trial by the Society.

2. The Stewards and Judges are instructed that the Gold Medals shall be awarded only in cases of special merit, and for Implements and Machines likely, in their opinion, to be practically useful.

SILVER MEDALS.

FOR NEW INVENTIONS.

1. There are Ten Silver Medals, the award of which the Judges appointed by the Council have the power of recommending in cases of sufficient merit in New Implements exhibited at the Carlisle Show.

2. These Medals cannot *in any case* be awarded to any implement, unless the principle of the implement, or of the improvement of it, be entirely new. No Medal shall be awarded by the Judges without the consent of the Stewards, and no Commendation of Miscellaneous Articles shall be made by the Judges.

3. The Judges are also empowered to make special awards of Medals for efficient modes of guarding or shielding Machinery, especially when worked by steam, from contact with persons immediately engaged in attending to such machinery while at work.

4. No Medal shall, in any case, be awarded to any Implement or Miscellaneous Article capable of Trial until it has been subjected to such Trial as the Stewards may direct.

CONDITIONS APPLYING TO CER ONLY.

Horses.

1. All foals must be the offspring of the mare a
exhibited; and the sire of the foal must be given on

2. No veterinary inspection of horses will be re
sidered necessary by the Judges, who will be accom
Inspectors. All hackneys and ponies will be measu
yard.

3. Hunters and Hackneys entered to compete in
will be disqualified if, in the opinion of the Judges, th
in the heavy-weight classes.

4. A charge of 1*l.* for the accommodation of a ho
entry-fee, will be made for each entry for stallions
foot. Flooring for the stalls will be provided at t
required.

5. A charge of 10*s.* will be made in addition to t
commodation of a stall for each animal in the other
for the horse-boxes will be provided at the exhibitor'

6. Any exhibitor wishing to remove his horse for
to do so on depositing 10*l.* at the Secretary's office,
pass—the time of leaving, and that of returning ne
thereon; and if the animal be not duly brought bac
forfeited to the Society for each Show day the animal
bitor will also forfeit any prize awarded to him in
Show, and will not be allowed to exhibit again at the
forfeits are paid.

Cattle.

7. No bull above two years old will be eligible for
have served not less than three different cows (or
months preceding the 1st of June in the year of the

8. All bulls above one year old shall have rings
noses, and be provided with leading sticks.

9. No cow will be eligible for a Prize unless certi
entry or between the date of entry and that of
living calf,—or that the calf, if dead, was born at
teen months preceding the date of the Show, and
mus [illegible] entered on the certificate. The cow must
[illegible] the time of the Show; and if in-calf only sh
[illegible] unless she is certified to have been bulled be
[illegible] the Show, nor will her owner afterwar
[illegible] have furnished the Secretary with a fur
[illegible] January in the subsequent year, that she p
[illegible] calf, if dead, was born at its proper time.

[illegible] every cow of the Channel Island breeds ente
[illegible] entered in the Dairy Classes, shall be milked dry
the Show, in the presence of an officer of the Societ
[illegible]

11. No heifer, entered as in-calf, will be eligible for a Prize unless she is certified to have been bulled before the 31st of March in the year of the Show, nor will her owner afterwards receive the Prize until he shall have furnished the Secretary with a further certificate before the 31st of January in the subsequent year, that she produced a living calf; or that the calf, if dead, was born at its proper time.

12. *Shorthorns.*—Each animal entered in the Shorthorn Classes must be certified by the Exhibitor to be entered, or eligible to be entered, in Coates's 'Herd-Book.'

SHEEP.

13. All rams, except shearlings, must have been used in the preceding year.

14. Sheep exhibited for any of the prizes must have been *really and fairly shorn bare* after the 1st of April in the year of the Show; and the date of such shearing must form part of the Certificate of Entry. Inspectors will be appointed by the Council to examine the sheep on their admission to the show-yard, with instructions to report to the Stewards any cases in which the sheep have not been *really and fairly shorn bare.*

PIGS.

15. The three sow-pigs in each pen must be of the same litter.

16. The breeding sows in Classes 156, 160, 164, 168, and 172, shall be certified to have had a litter of live pigs within the six months preceding the Show, or to be in-pig at the time of entry, so as to produce a litter before the 1st of September following. In the case of in-pig sows, the Prize will be withheld until the exhibitor shall have furnished the Secretary with a certificate of farrowing, as above.

17. No sow, above eighteen months old, that has not produced a litter of live pigs, shall be eligible to compete in any of the classes.

18. The Judges of pigs will be instructed, with the sanction of the Stewards, to withhold prizes from any animals which shall appear to them to have been entered in a wrong class.

19. All pigs exhibited at the Country Meetings of the Society shall be subjected to an examination of their mouths by the Veterinary Inspector of the Society; and should the state of dentition in any pig indicate that the age of the animal has not been correctly returned in the Certificate of Entry, the Stewards shall have power to disqualify such pig, and shall report the circumstance to the Council at its ensuing Monthly Meeting. Every pig which shall be found on examination by the Inspector to be oiled or coloured will be disqualified for competition and removed from the Show-Yard; as well as any pig which shall be oiled or coloured while in the Show-Yard.

20. If a litter of pigs be sent with a breeding sow, the young pigs must be the produce of the sow, and must not exceed two months old.

RULES OF ADJUDICATION.

1. As the object of the Society in giving prizes for cattle, sheep, and pigs, is to promote improvement in *breeding* stock, the Judges, in making their awards, will be instructed not to take into their consideration the present value to the butcher of animals exhibited, but to decide according to their relative merits for the purpose of *breeding.*

2. If, in the opinion of the Judges, there should be equality of merit, they

will be instructed to make a special report to the Council, who will decide on the award.

3. The Judges will be instructed to withhold any prize if they are of opinion that there is not sufficient merit in any of the stock exhibited for such Prize to justify an award.

4. The Judges will be instructed to give in a *Reserved Number* in each class of live stock: viz., which animal would, in their opinion, possess sufficient merit for the Prize, in case the animal to which the Prize is awarded should subsequently become disqualified.

5. In the classes for stallions, mares, and fillies, the Judges, in awarding the Prizes will be instructed, in addition to symmetry, to take activity and strength into their consideration.

6. The attention of the Stewards and Judges is particularly called to the conditions applying to pigs. The Senior Steward of Live Stock is requested to report any malpractices on the part of Exhibitors, and any person found guilty will not be allowed to exhibit at future Meetings of the Society.

The Judges will be instructed to deliver to the Stewards their awards, signed, and stating the numbers to which the Prizes are adjudged, before they leave the Yard, noting any disqualifications. They are to transmit, under cover to the Secretary immediately after the Show, their Reports on the several classes in which they have adjudicated, in order that each Report may be included in the General Report of the Exhibition of Live Stock at Carlisle, to be published in the 'Journal' of the Society.

DATES OF ENTRY FOR LIVE STOCK AND IMPLEMENTS.

Certificates for the entry of Implements for the Carlisle Meeting must be forwarded to the Secretary of the Society, No. 12, Hanover Square, London, W., by the 1st of April, and Certificates for the entry of Live Stock, Butter, &c., by the 1st of May. Certificates received after those respective dates will not be accepted, but returned to the persons by whom they have been sent.

The Prizes of the Royal Agricultural Society of England, and all Prizes offered by the Carlisle Local Committee, are open to general competition.

⁂ Forms of Certificate for entry, as well as Prize-Sheets for the Carlisle Meeting, containing the whole of the conditions and regulations, may be obtained at the Office of the Society, No. 12, Hanover Square, London, W.

MEMORANDA.

Address of Letters.—The Society's office being situated in the postal district designated by the letter W, Members, in their correspondence with the Secretary, are requested to subjoin that letter to the usual address.

General Meeting in London, December 11th, 1879.

General Meeting in London, May 22, 1880, at 12 o'clock.

Meeting at Carlisle, July 12th and four following days, 1880.

Monthly Council (for transaction of business), at 12 o'clock on the first Wednesday in every month, excepting January, September, and October: open only to Members of Council and Governors of the Society.

Adjournments.—The Council adjourn over Passion and Easter weeks, when those weeks do not include the first Wednesday of the month; from the first Wednesday in August to the first Wednesday in November; and from the first Wednesday in December to the first Wednesday in February.

Office Hours.—10 to 4. On Saturdays, 10 to 2.

Diseases of Cattle, Sheep, and Pigs.—Members have the privilege of applying to the Veterinary Committee of the Society, and of sending animals to the Royal Veterinary College, Camden Town, N.W.—(A statement of these privileges will be found on page xxxii in this Appendix.)

Chemical Analysis.—The privileges of Chemical Analysis enjoyed by Members of the Society will be found stated in this Appendix (page xxxiii).

Botanical Privileges.—The Botanical and Entomological Privileges enjoyed by Members of the Society will be found stated in this Appendix (page xxxvi).

Subscriptions.—1. Annual.—The subscription of a Governor is £5, and that of a Member £1, due in advance on the 1st of January of each year, and becoming in arrear if unpaid by the 1st of June. 2. For Life.—Governors may compound for their subscription for future years by paying at once the sum of £50, and Members by paying £10. Governors and Members who have paid their annual subscription for 20 years or upwards, and whose subscriptions are not in arrear, may compound for future annual subscriptions, that of the current year inclusive, by a single payment of £25 for a Governor, and £5 for a Member.

Payments.—Subscriptions may be paid to the Secretary, in the most direct and satisfactory manner, either at the Office of the Society, No. 12, Hanover Square, London, W., or by means of post-office orders, to be obtained at any of the principal post-offices throughout the kingdom, and made payable to him at the Vere Street Office, London, W.; but any cheque on a banker's or any other house of business in London will be equally available, if made payable on demand. In obtaining post-office orders care should be taken to give the postmaster the correct initials and surname of the Secretary of the Society (H. M. Jenkins), otherwise the payment will be refused to him at the post-office on which such order has been obtained; and when remitting the money-orders it should be stated by whom, and on whose account, they are sent. Cheques should be made payable as drafts on demand (not as bills only payable after sight or a certain number of days after date), and should be drawn on a London (not on a local country) banker. When payment is made to the London and Westminster Bank, St. James's Square Branch, as the bankers of the Society, it will be desirable that the Secretary should be advised by letter of such payment, in order that the entry in the banker's book may be at once identified, and the amount posted to the credit of the proper party. No coin can be remitted by post, unless the letter be registered.

New Members.—Every candidate for admission into the Society must be proposed by a Member; the proposer to specify in writing the full name, usual place of residence, and post-town, of the candidate, either at a Council meeting, or by letter addressed to the Secretary. Forms of Proposal may be obtained on application to the Secretary.

⁂ Members may obtain on application to the Secretary copies of an Abstract of the Charter and Bye-laws, of a Statement of the General Objects, &c., of the Society, of Chemical, Botanical, and Veterinary Privileges, and of other printed papers connected with special departments of the Society's business.

Members' Veterinary Privileges.

I.—VISITS OF THE VETERINARY INSPECTOR.

1. Any Member of the Society who may desire professional attendance and special advice in cases of disease among his cattle, sheep, or pigs, should apply to the Secretary of the Society, or to the Principal of the Royal Veterinary College, and Consulting Veterinary Surgeon, Camden Town, London, N.W.

2. The remuneration of the Consulting Veterinary Surgeon or Inspector will be 2*l.* 2*s.* each day as a professional fee, and the charge for personal expenses, *when such have been incurred*, will in no cases exceed one guinea per diem. He will also be allowed to charge the cost of travelling to and from the locality where his services may have been required. These charges may, however, in cases of serious or extensive outbreaks of contagious disease, be reduced or remitted altogether, so far as the Members of the Society are concerned, at the discretion of the Council, on such step being recommended to them by the Veterinary Committee.

3. The Inspector, on his return from visiting the diseased stock, will report to the Member, and, through the Principal of the Royal Veterinary College, to the Committee, in writing, the results of his observations and proceedings, which Report will be laid before the Council.

4. When contingencies arise to prevent a personal discharge of the duties, the Consulting Veterinary Surgeon, may, subject to the approval of the Committee, name some competent professional person to act in his stead, who shall receive the same rates of remuneration.

II.—CONSULTATIONS WITHOUT VISIT.

Personal consultation with Veterinary Inspector	10*s.* 6*d.*
Consultation by letter	10*s.* 6*d.*
Post-mortem examination, and report thereon	21*s.*

A return of the number of applications from Members of the Society during each half-year is required from the Veterinary Inspector.

III.—ADMISSION OF DISEASED ANIMALS TO THE ROYAL VETERINARY COLLEGE, CAMDEN TOWN, N.W.; INVESTIGATIONS AND REPORTS.

1. All Members of the Society have the privilege of sending cattle, sheep, and pigs to the Infirmary of the Royal Veterinary College, on the following terms; viz., by paying for the keep and treatment of cattle 10*s.* 6*d.* per week each animal, and for sheep and pigs, 3*s.* 6*d.* per week.

No. 2. A detailed Report of the cases of cattle, sheep, and pigs treated in the Infirmary of the College or on Farms in the occupation of Members of the Society, will be furnished to the Council quarterly; and also special reports from time to time on any matter of unusual interest which may come under the notice of the Officers of the College

By Order of the Council,

H. M. JENKINS, *Secretary.*

Members' Privileges of Chemical Analysis

(Applicable only to the case of Persons who are not commercially engaged in the manufacture or sale of any substance sent for Analysis).

THE Council have fixed the following rates of Charges for Analysis to be made by the Consulting Chemist for the *bonâ-fide* and sole use of Members of the Society; who, to avoid all unnecessary correspondence, are particularly requested, when applying to him to mention the kind of analysis they require, and to quote its number in the subjoined schedule. The charge for analysis, together with the carriage of the specimens (if any), must be paid to him by Members at the time of their application:

No. 1.	—An opinion of the genuineness and value of bone-dust or oil-cake (each sample)	5*s.*
,, 2.	—An estimate of the value (relatively to the average samples in the market) of sulphate and muriate of ammonia and of the nitrate of potash and soda	5*s.*
,, 3.	—An analysis of guano; showing the proportion of moisture, organic matter, sand, phosphate of lime, alkaline salts and ammonia, and an estimate of its value, provided the selling price of the article to be analysed be sent with it	10*s.*
,, 4.	—An analysis of mineral superphosphate of lime for soluble phosphates only, and an estimate of its value, provided the selling price of the article to be analysed be sent with it	5*s.*
,, 5.	—An analysis of superphosphate of lime, showing the proportions of moisture, organic matter, sand, soluble and insoluble phosphates, sulphate of lime, and ammonia, and an estimate of its value, provided the selling price of the article to be analysed be sent with it	10*s.*
,, 6.	—An analysis, showing the value of any ordinary artificial manure	10*s.*
,, 7.	—An analysis of limestone, showing the proportion of lime	7*s.* 6*d.*
,, 8.	—An analysis of limestone, showing the proportion of magnesia, 10*s.*; the proportion of lime and magnesia	10*s.*
,, 9.	—An analysis of limestone or marls, showing the proportion of carbonate, phosphate, and sulphate of lime and magnesia, with sand and clay	10*s.*
,, 10.	—Partial analysis of a soil, including determinations of clay, sand, organic matter, and carbonate of lime	10*s.*
,, 11.	—Complete analysis of a soil	£3
,, 12.	—An analysis of oil-cake or other substance used for feeding purposes, showing the proportion of moisture, oil, mineral matter, albuminous matter, and woody fibre, as well as of starch, gum, and sugar in the aggregate; and an estimate of its value as compared with pure linseed-cake	10*s.*
,, 13.	—Analysis of any vegetable product	10*s.*
,, 14.	—Analysis of animal products, refuse substances used for manures, &c.	from 10*s.* to £1
,, 15.	—Determination of the "hardness" of a sample of water before and after boiling	5*s.*
,, 16.	—Analysis of water of land-drainage, and of water used for irrigation	£1
,, 17.	—Analysis of water used for domestic purposes	£1 10*s.*
,, 18.	—Determination of nitric acid in a sample of water	10*s.*
,, 19.	—Personal consultation with the Consulting Chemist. (The usual hours of attendance for the Director, Monday excepted, will be from 11 to 2, but to prevent disappointment, it is suggested that members desiring to hold a consultation with the Director should write to make an appointment)	5*s.*
,, 20.	—Consultation by letter	5*s.*
,, 21.	—Consultation necessitating the writing of three or more letters	10*s.*

The Laboratory of the Society is at 12, Hanover Square, London, W., to which address the Consulting Chemist, Dr. AUGUSTUS VOELCKER, F.R.S., requests that all letters and parcels (postage and carriage paid) from Members of the Society, who are entitled to avail themselves of the foregoing Privileges, should be directed.

GUIDE TO THE PURCHASE OF ARTIFICIAL MANURES AND FEEDING STUFFS.

FEEDING CAKES.

1. *Linseed-cake* should be purchased as " Pure," and the insertion of thi word on the invoice should be insisted upon. The use of such words a " Best," " Genuine," &c., should be objected to by the purchaser.

2. *Rape-cake for feeding purposes* should be guaranteed " Pure " and purchased by sample.

3. *Decorticated Cotton-cake* should be guaranteed " Pure," and purchased by sample.

4. *Undecorticated Cotton-cake* should be guaranteed " Pure," and purchased by sample.

N.B.—All feeding cakes should be purchased in good condition, and the guarantee of the vendor should be immediately checked by a fair sample (taken out of the middle of the cake) being at once sent for examination to a competent analytical chemist. The remainder of the cake from which the sample sent for examination had been taken should be sealed up in the presence of a witness, and retained by the purchaser for reference in case of dispute.

ARTIFICIAL MANURES.

1. *Raw or Green Bones or Bone-dust* should be purchased as " Pure " Raw Bones guaranteed to contain not less than 45 per cent. of tribasic phosphate of lime, and to yield not less than 4 per cent. of ammonia.

2. *Boiled Bones* should be purchased as " Pure " Boiled Bones guaranteed to contain not less than 48 per cent. of tribasic phosphate of lime, and to yield not less than 1¾ per cent. of ammonia.

3. *Dissolved Bones* are made of various qualities, and are sold at various prices per ton ; therefore the quality should be guaranteed, under the heads of *soluble* phosphate of lime, *insoluble* phosphate of lime, and nitrogen or its equivalent as ammonia. The purchaser should also stipulate for an allowance for each unit per cent. which the dissolved bones should be found on analysis to contain less than the guaranteed percentages of the three substances already mentioned.

4. *Mineral Superphosphates* should be guaranteed to be delivered in a sufficiently dry and powdery condition, and to contain a certain percentage of *soluble* phosphate of lime, at a certain price per unit per cent., no value to be attached to *insoluble* phosphates.

5. *Compound Artificial Manures* should be purchased in the same manner and with the same guarantees as Dissolved Bones.

6. *Nitrate of Soda* should be guaranteed by the vendor to contain from 94 to 95 per cent. of pure nitrate.

7. *Sulphate of Ammonia* should be guaranteed by the vendor to contain not less than 23 per cent. of ammonia.

8. *Peruvian Guano* should be sold under that name, and guaranteed to be in a dry and friable condition, and to contain a certain percentage of ammonia.

N.B.—Artificial manures should be guaranteed to be delivered in a sufficiently dry and powdery condition to admit of distribution by the drill. A sample for analysis should be taken, not later than three days after delivery, by emptying several bags, mixing the contents together, and filling two tins holding about half a pound each, in the presence of a witness. Both the tins should be sealed, one kept by the purchaser for reference in case of dispute, and the other forwarded to a competent analytical chemist for examination.

INSTRUCTIONS FOR SELECTING AND SENDING SAMPLES FOR ANALYSIS.

ARTIFICIAL MANURES.—Take a large handful of the manure from three or four bags, mix the whole on a large sheet of paper, breaking down with the hand any lumps present, and fold up in tinfoil, or in oil silk, about 3 oz. of the well-mixed sample, and send it to 12, HANOVER SQUARE, LONDON, W., by post: or place the mixed manure in a small wooden or tin box, which may be tied by string, but must not be sealed, and send it by post. If the manure be very wet and lumpy, a larger boxful, weighing from 10 to 12 oz., should be sent either by post or railway.

Samples not exceeding 4 oz. in weight may be sent by post, by attaching two penny postage stamps to the parcel.

Samples not exceeding 8 oz., for three postage stamps.

Samples not exceeding 12 oz., for four postage stamps.

The parcels should be addressed: DR. AUGUSTUS VOELCKER, 12, HANOVER SQUARE, LONDON, W., and the address of the sender or the number or mark of the article be stated on parcels.

The samples may be sent in covers, or in boxes, bags of linen or other materials. No parcel sent by post must exceed 12 oz. in weight, 1 foot 6 inches in length, 9 inches in width, and 6 inches in depth.

SOILS.—Have a wooden box made 6 inches long and wide, and from 9 to 12 inches deep, according to the depth of soil and subsoil of the field. Mark out in the field a space of about 12 inches square; dig round in a slanting direction a trench, so as to leave undisturbed a block of soil with its subsoil from 9 to 12 inches deep; trim this block or plan of the field to make it fit into the wooden box, invert the open box over it, press down firmly, then pass a spade under the box and lift it up, gently turn over the box, nail on the lid and send it by goods or parcel to the laboratory. The soil will then be received in the exact position in which it is found in the field.

In the case of very light, sandy, and porous soils, the wooden box may be at once inverted over the soil and forced down by pressure, and then dug out.

WATERS.—Two gallons of water are required for analysis. The water, if possible, should be sent in glass-stoppered Winchester half-gallon bottles, which are readily obtained in any chemist and druggist's shop. If Winchester bottles cannot be procured, the water may be sent in perfectly clean new stoneware spirit-jars surrounded by wickerwork. For the determination of the degree of hardness before and after boiling, only one quart wine-bottle full of water is required.

LIMESTONES, MARLS, IRONSTONES, AND OTHER MINERALS.—Whole pieces, weighing from 3 to 4 oz., should be sent enclosed in small linen bags, or wrapped in paper. Postage 2*d.*, if under 4 oz.

OILCAKES.—Take a sample from the middle of the cake. To this end break a whole cake into two. Then break off a piece from the end where the two halves were joined together, and wrap it in paper, leaving the ends open, and send parcel by post. The piece should weigh from 10 to 12 oz. Postage, 4*d.* If sent by railway, one quarter or half a cake should be forwarded.

FEEDING MEALS.—About 3 oz. will be sufficient for analysis. Enclose the meal in a small linen bag. Send it by post.

On forwarding samples, separate letters should be sent to the laboratory, specifying the nature of the information required, and, if possible, the object in view.

H. M. JENKINS, *Secretary.*

Members' Botanical and Entomological Privileges.

The Council have fixed the following **Rates of Charge** for the examination of Plants, Seeds, and Insects for the *bonâ-fide* use of Members of the Society, who are particularly requested, when applying to the Consulting Botanist, to mention the kind of examination they require, and to quote its number in the subjoined Schedule. The charge for examination must be paid to the Consulting Botanist at the time of application, and the carriage of all parcels must be prepaid.

I. BOTANICAL.

No. 1.—A report on the purity, amount and nature of foreign materials, perfectness, and germinating power of a sample of seeds	5s.
„ 2.—Detailed report on the weight, purity, perfectness, and germinating power of a sample of seeds, with a special description of the weeds and other foreign materials contained in it	10s.
„ 3.—Determination of the species of any weed or other plant, or of any epiphyte or vegetable parasite, with a report on its habits, and the means of its extermination or prevention	5s.
„ 4.—Report on any disease affecting the farm crop	5s.
„ 5.—Determination of the species of a collection of natural grasses found in any district on one kind of soil, with a report on their habits and pasture value	10s.

II. ENTOMOLOGICAL.

„ 6.—Determination of the species of any insect, worm, or other animal which, in any stage of its life, injuriously affects the farm crops, with a report on its habits and suggestions as to its extermination	5s.

INSTRUCTIONS FOR SELECTING AND SENDING SPECIMENS.

In sending seed or corn for examination the utmost care must be taken to secure a fair and honest sample. If anything supposed to be injurious or useless exists in the corn or seed, selected samples should also be sent.

In collecting specimens of plants, the whole plant should be taken up, and the earth shaken from the roots. If possible, the plant must be in flower or fruit. They should be packed in a light box, or in a firm paper parcel.

Specimens of diseased plants or of parasites should be forwarded as fresh as possible. Place them in a bottle, or pack them in tin-foil or oil-silk.

All specimens should be accompanied with a letter specifying the nature of the information required, and stating any local circumstances (soil, situation, &c.) which, in the opinion of the sender, would be likely to throw light on the inquiry.

N.B.—*The above Scale of Charges is not applicable in the case of Seedsmen requiring the services of the Consulting Botanist.*

Parcels or letters (Carriage or Postage prepaid) to be addressed to Mr. W. Carruthers, F.R.S., 4, Woodside Villas, Gipsy Hill, London, S.E.

H. M. JENKINS, *Secretary.*

Royal Agricultural Society of England.

1880–81.

President.

Mr. WILLIAM WELLS.

Trustees.

Year when Elected.	
1879	H.R.H. The Prince of Wales, K.G., *Marlborough House, Pall Mall*, S.W.
1855	Acland, Sir Thomas Dyke, Bart., M.P., *Sprydoncote, Exeter, Devonshire.*
1857	Bridport, General Viscount, *Cricket St. Thomas, Chard, Somersetshire.*
1850	Chesham, Lord, *Latimer, Chesham, Bucks.*
1861	Dent, J. D., *Ribston Hall, Wetherby, Yorkshire.*
1863	Kingscote, Colonel, M.P., *Kingscote, Wotton-under-Edge, Gloucestershire.*
1868	Lichfield, Earl of, *Shugborough, Staffordshire.*
1854	Macdonald, Sir Archibald Keppel, Bt., *Woolmer Lodge, Liphook, Hants.*
1860	Marlborough, Duke of, K.G., *Blenheim Park, Oxford.*
1839	Portman, Viscount, *Bryanston, Blandford, Dorset.*
1856	Powis, Earl of, *Powis Castle, Welshpool, Montgomeryshire.*
1858	Rutland, Duke of, K.G., *Belvoir Castle, Grantham, Leicestershire.*

Vice-Presidents.

1861	Cathcart, Earl, *Thornton-le-Street, Thirsk, Yorkshire.*
1873	Bedford, Duke of, K.G., *Woburn Abbey, Bedfordshire.*
1839	Chichester, Earl of, *Stanmer Park, Lewes, Sussex.*
1867	Devonshire, Duke of, K.G., *Holker Hall, Lancashire.*
1847	Eversley, Viscount, *Heckfield Place, Winchfield, Hants.*
1848	Gibbs, Sir Brandreth, 13, *Pelham Crescent, South Kensington*, S.W.
1858	Kerrison, Sir Edward C., Bart., *Brome Hall, Scole, Suffolk.*
1872	Lathom, Earl of, *Lathom Hall, Ormskirk, Lancashire.*
1848	Lawes, John Bennet, *Rothamsted, St. Albans, Herts.*
1852	Richmond and Gordon, Duke of, K.G., *Goodwood, Chichester, Sussex.*
1859	Vernon, Lord, *Sudbury Hall, Derby.*
1855	Wynn, Sir Watkin Williams, Bart., M.P., *Wynnstay, Ruabon, Denbighshire.*

Other Members of Council.

1858	Amos, Charles Edwards, 5, *Cedars Road, Clapham Common, Surrey.*
1877	Arkwright, J. H., *Hampton Court, Leominster, Herefordshire.*
1880	Ashworth, Alfred, *Poynton, Cheshire.*
1875	Aveling, Thomas, *Rochester, Kent.*
1875	Aylmer, Hugh, *West Dereham, Stoke Ferry, Norfolk.*
1863	Bowly, Edward, *Siddington House, Cirencester, Gloucestershire.*
1861	Cantrell, Charles S., *Riding Court, Datchet (Bucks), Windsor.*
1880	Carrington, W. T., *Croxden Abbey, Uttoxeter, Staffordshire.*
1874	Chandos-Pole-Gell, H., *Hopton Hall, Wirksworth, Derbyshire.*
1878	Davies, David Reynolds, *Agden Hall, Lymm, Cheshire.*
1860	Druce, Joseph, *Eynsham, Oxford.*
1871	Egerton, Hon. Wilbraham, M.P., *Rostherne Manor, Knutsford, Cheshire.*
1873	Evans, John, *Uffington, Shrewsbury, Salop.*
1876	Feversham, Earl of, *Duncombe Park, Helmsley, Yorkshire.*

Year when Elected.	
1879	Foster, S. P., *Killhow. Carlisle, Cumberland.*
1875	Frankish, William, *Limber Magna, Ulceby,*
1879	Gorringe, Hugh, *Kingston-by-Sea, Shoreham,*
1874	Hemsley, John, *Shelton, Newark, Notts.*
1876	Howard, Charles, *Biddenham, Bedford.*
1878	Howard, James, M.P., *Clapham Park, Bedfor*
1871	Jones, J. Bowen, *Ensdon House, Montford Bri*
1869	Leeds, Robert, *Keswick Old Hall, Norwich.*
1872	Leicester, Earl of, K.G., *Holkham Hall, Well*
1874	Lindsay, Colonel Loyd, M.P., *Lockinge Park,*
1865	Lopes, Sir Massey, Bart., M.P., *Maristow, Rob*
1871	McIntosh, David, *Havering Park, Romford,*
1874	Martin, Joseph, *Highfield House, Littleport,*
1880	Moreton, Lord, M.P., *Tortworth Court, Falfic*
1879	Neville, Robert, *Butleigh Court, Glastonbury*
1878	Odams, James, *The Grange, Bishop Stortford,*
1857	Pain, Thomas, *The Grove, Basingstoke, Hants.*
1861	Randell, Charles, *Chadbury, Evesham, Worc*
1875	Ransome, Robert Charles, *Ipswich, Suffolk.*
1867	Ravensworth, Earl of, *Ravensworth Castle,*
1871	Rawlence, James, *Bulbridge, Wilton, Salisbu*
1869	Ridley, Sir M. White, Bart., M.P., *Blagdon, Cr*
1875	Russell, Robert, *Horton Court Lodge, Dartfo*
1874	Sanday, George Henry, *Wensley House, Bed*
1878	Sheraton, William, *Broom House, Ellesmere,*
1856	Shuttleworth, Joseph, *Hartsholme Hall, Lin*
1874	Spencer, Earl, K.G., *Althorpe, Northampton.*
1875	Stratton, Richard, *The Duffryn, Newport,*
1874	Turbervill, Lieut.-Col. Picton, *Ewenny Prio*
1845	Turner, George, *Great Bowley, Tiverton, Dev*
1871	Turner, Jabez, *Norman Cross, Yaxley, Hunti*
1871	Wakefield, William H., *Sedgwick, Kendal,*
1870	Welby-Gregory, Sir William Earle, Ba *Grantham, Lincolnshire.*
1870	Whitehead, Charles, *Barming House, Maids*
1865	Wilson, Jacob, *Woodhorn Manor, Morpeth,*
1878	Wise, George, *Woodcote, Warwick.*

Secretary and Editor.

H. M. JENKINS, 12, *Hanover Square,*

Consulting Chemist—Dr. Augustus Voelcker, F.R.S.,
Consulting Botanist—W. Carruthers, F.R.S., F.L.S.,
Consulting Veterinary Surgeon—Professor James Bea
nary College, Camden Town, N.W.
Veterinary Inspectors—The Officers of the Royal
Consulting Engineers—Eastons & Anderson, 3, *White*
Consulting Surveyor—George Hunt, *Evesham, Worce*
Seedsmen—Thomas Gibbs and Co., *Corner of Halfmoo*
Publisher—John Murray, 50, *Albemarle Street,* W.
Bankers The London and Westminster Bank, *St. J*

STANDING COMMITTEES FOR 1880.

Finance Committee.

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Bridport, General Viscount.
Ridley, Sir M. White, Bt.
Davies, D. R.
Frankish, W.
Randell, Charles.
Shuttleworth, J.

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Gibbs, Sir Brandreth.
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Kingscote, Colonel.

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Frankish, W.
Hemsley, J.
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Wise, G.

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Jones, J. Bowen.
Lawes, J. B.
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Whitehead, Charles.

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Fleming, George.
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Sanderson, Dr. J. Burdon.
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Wilson, Jacob.

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Arkwright, J. H.
Aylmer, H.
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Davies, D. R.
Evans, John.

Frankish, W.
Gorringe, H.
Hemsley, J.
Howard, C.
McIntosh, D.
Pain, T.
Sanday, G. H.
Sheraton, W.

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Gibbs, Sir Brandreth.
Anderson, W.
Aveling, T.
Frankish, W.
Howard, C.

Howard, J.
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Martin, J.
Neville, R.
Ransome, R. C.
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Sheraton, W.

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Coke, Hon. E.
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Dent, J. D.
Foster, S. P.
Frankish, W.
Gorringe, H.
Hemsley, J.
Hobson, Alderman.
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Murray, G.

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Wilson, Jacob (Chairman).
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Amos, C. E.
Aveling, T.

Chandos-Pole-Gell,
Frankish, W.
Hemsley, J.
Howard, C.

Committee of Selecti

Cathcart, Earl.
Bridport, Gen. Visct.

Skelmersdale, Lord.
Chandos-Pole-Gell,
Hemsley, J.

And the Chairmen of the Standing

Education Committ

Dent, J. D. (Chairman).
Bedford, Duke of.
Aveling, T.

Jones, J. Bowen.
Neville, R.
Kingscote, Colonel.
Turbervill, Lieut.-Col

Cattle Plague Comm

The whole Council.

* The President, Trustees, and Vice-Presid
of all Committees.

Royal Agricultural Society of England.

GENERAL MEETING,

12, HANOVER SQUARE, SATURDAY, MAY 22ND, 1880.

REPORT OF THE COUNCIL.

SINCE the last General Meeting in December, 1 Governor and 225 Members have been elected; but, on the other hand, the death of 1 Governor and 59 Members has been reported, and the names of 92 Members, who resigned in the course of the year 1879, and of 36 whose subscriptions are not recoverable, have been removed from the list. The Society now consists of—

83 Life Governors,
70 Annual Governors,
2673 Life Members,
5083 Annual Members,
20 Honorary Members,

making a total of 7929, and showing an increase of 38 since the December Meeting.

The Council have to report with much regret the loss of the services of three of their number, by the death of Mr. Torr, M.P., and of Mr. Masfen, and by the resignation of Mr. Edmonds. The first-named vacancy has been filled up by the election of Mr. Alfred Ashworth, of Poynton, Cheshire, and the others are still under the consideration of the Council.

The accounts for the year 1879 have been examined and certified by the Auditors and Accountants of the Society, and have been published in the last number of the 'Journal,' together with the statement of Receipts and Expenditure connected with the London Exhibition. The funded property of the Society remains the same as at the end of last year, and therefore stands at 12,430*l.* 7*s.* New Three per Cents. The balance of the current account in the hands of the Society's bankers, on the 1st instant, was 2806*l.* 1*s.* 1*d.*, and 2000*l.* remained on deposit.

The Carlisle Meeting will commence on Monday, July 12th, and close on Friday, July 16th. Prizes have been offered by the Society and by the Carlisle Local Committee for the chief breeds of Cattle and Sheep, which are distinctive of the Border Counties and of Scotland, in addition to the classes which are ordinarily included in the Prize-sheets. The Council hope that interest on both sides of the Border will thus be aroused, and aid in bringing the Society's second Meeting at Carlisle to a successful issue.

In consequence of the great interest manifested in the Exhibition of Dairy Machinery at work in the Kilburn Showyard, the Council have arranged with the Aylesbury Dairy Company to exhibit the chief kinds of Butter-making Utensils at Carlisle, and to make Butter in the Showyard on the several systems which prevail in different districts of England, on the Continent of Europe, and in America.

The district assigned for the Country Meeting of 1881 comprises the counties of Derby, Leicester, Lincoln, Northampton, Nottingham, and Rutland; and the Council have decided to accept a most cordial invitation, which they have received from the Mayor and Corporation of Derby, to hold the Country Meeting of 1881 in that locality.

The Country Meeting for 1882 will be held in the district which comprises Cornwall, Devonshire, Dorsetshire, Somersetshire, Wiltshire, Hampshire, Berkshire, Surrey, Sussex, and Kent, in accordance with the scheme of rotation which is at present followed.

The result of the first year's work in the new Laboratory has been highly satisfactory to the Council. The number of analyses has increased from about 700 to 1200, and while the charge on the funds of the Society has remained practically the same as in former years, the cost of each analysis to Members of the Society has been reduced to half the previous rates.

The question of the comparative manurial value of solubl and insoluble phosphates has recently attracted much attentio [illegible] given rise to considerable discussion. The Council, there [illegible] requested Dr. Voelcker to write a short statement of th [illegible]ent condition of our knowledge of the subject for the info mation of Members of the Society, and this paper has been published in the last number of the 'Journal.' The Council have further accepted the generous offer of His Grace the Duke of Bedford, the President of the Society, of a field adjoining Crawley Farm, for the purpose of carrying on further experiments on the comparative manurial value of soluble and insoluble phosphates.

Contagious Diseases of animals of the farm have not prevailed to any considerable extent during the last year; Foot-and-mouth Disease has almost ceased to exist in the country; but the Council have remarked with the greatest concern the ravages of the Rot in sheep and cattle. With a view to diffuse the most accurate information on this subject, the Council requested Professor Simonds to prepare a Revised Edition of his original Treatise on this malady. They have published this Report at a nominal charge, and are glad to be able to state that some thousands of copies have been sold. They also published in the Agricultural Newspapers, last February, a short Code of Directions to farmers whose sheep might be suffering from this affection; and in the last number of the 'Journal' of the Society is a further contribution from Professor Simonds on the same subject. The Council have also instructed the Veterinary Committee to consider the desirability of making an investigation into the recent outbreak of this disease, and to report how they can carry out such investigation; and also whether they are of opinion that local inquiries should be carried out under the direction of the Council.

The investigations into Anthracoid Diseases, especially splenic apoplexy and quarter-evil, which were commenced in 1878, at the Brown Institution, by Dr. Burdon Sanderson, have since been continued there by his successor, Dr. Greenfield. The Reports of these authorities up to the end of last year are contained in the last number of the 'Journal.'

The Council have arranged with the Governors of the Royal Veterinary College for a simplification of the previous statement of Members' Veterinary Privileges; and the Rules now in force have been published in the Appendix to the last number of the 'Journal.'

Three Graduates of the Royal College of Veterinary Surgeons, out of six who were eligible, presented themselves to compete for the Society's Medals and Prizes offered for proficiency in Cattle Pathology. The Examiners adjudicated the First Prize and Gold Medal to Mr. William Alston Edgar, of Westfield House, Dartford, Kent; the Second Prize and Silver Medal to Mr. William Frank Smith, of Bull Hotel, Bromley, Kent; and the Third Prize and Bronze Medal to Mr. Nicholson Almond, of Great Clacton, Colchester.

The Council regret that the Highland and Agricultural Society of Scotland do not at present see their way clear to adopt a joint scheme of Examination for these Prizes, whereby they would be thrown open to Graduates of all the Veterinary Schools in the United Kingdom.

Nine candidates presented themselves at the recent Senior Examination in Practical and Scientific Agriculture for the Society's Prizes and Certificates; but only four satisfied the Examiners in all the subjects necessary to qualify them for the First-class Certificates and Life Membership of the Society, as well as to earn payments as teachers of the principles of agriculture under the Departments of Science and Art. One candidate also obtained a Second-class Certificate. The successful candidates were:—

FIRST CLASS.

Michael Falcon, jun., Whitfield, R.S.O., Glos. (R. A. Coll.), 1st prize, 25*l.*

R. J. B. Clements, Spa, Gloucester (R. A. Coll.), 2nd prize, 15*l.*

Primrose M'Connell, Lymm, Cheshire (Edinburgh University), 3rd prize, 10*l.*

Gerard de Lisle, Garendon Park, Loughborough (R. A. Coll.), 4th prize, 5*l.*

SECOND CLASS.

Richard Henderson, The Grange, Kirkcudbright, N. B. (educated at Edinburgh).

At the recommendation of the Education Committee, the Council have revised the conditions relating to the Junior Scholarships, so as to enable any boys, who might prove themselves qualified, to hold them under certain regulations. The following are the principal regulations which must be complied with by candidates desiring to compete for these Scholarships:—

Candidates for the Scholarships must be between fourteen and eighteen years of age.

Candidates still at school can only be entered for these Scholarships by the Head-masters of their respective Schools. Other candidates must satisfy the Education Committee of their fitness to compete by sending certificates of education, or of their having passed any examinations in connection with the Science and Art Department, or of any University in the United Kingdom.

Any Head-master intending to enter candidates for these Scholarships, and any candidate intending to enter himself, must inform the Secretary of the Royal Agricultural Society of his intention to do so, on or before the 1st of October in each year. All entries must be made on or before October 15th; and these final entries must give the Christian and Surname as well as the date of birth of each candidate entered.

Annual Examinations will be held in the month of November simultaneously at such Schools as have candidates, and at the Society's Rooms, 12, Hanover Square, London, W.; and the Scholarships will be awarded to the boys who obtain the highest aggregate number of marks.

The subjects for examination for the Scholarships will be:—1. Land Surveying. 2. Elementary Mechanics, as applied to Agriculture. 3. Chemistry, as applied to Agriculture. 4. The Principles of Agriculture, especially with reference to the Rotation of Crops, the Nutrition of Plants and Animals, and the Mechanical Cultivation of the Soil.

By order of the Council,

H. M. JENKINS, *Secretary.*

ROYAL AGRICULTURA

DR.

HALF-YEARLY CASH ACCOUN

	£	s.	d.	£	s.	d.	£	s.
To Balance in hand, 1st January, 1880:—								
Bankers				682	13	4		
Secretary				20	17	4		
							703	10
To Income:—								
Dividends on Stock				182	11	5		
Interest on Deposit				12	1	7		
Subscriptions:—								
Governors' Life-Compositions	140	0	0					
Governors' Annual	320	0	0					
Members' Life-Compositions	768	0	0					
Members' Annual	3501	4	0					
				4,729	4	0		
Establishment:—								
Rent				100	0	0		
Journal:—								
Advertisements	44	17	2					
Sale of 'Hints on Butter Making'	22	2	9					
Sale of 'Rot in Sheep'	6	0	0					
				72	19	11		
Chemical:—								
Laboratory Fees				123	15	6		
Veterinary:—								
Professional Fees				9	10	0		
London Exhibition				285	3	4		
Total Income				..	..	..	5,515	5
To Carlisle Meeting				..	..	..	6,540	12
							£12,759	

BALANCE-SHE

LIABILITIES.	£	s.	d.	£	s.	d.	£	s.
To Capital:—								
Surplus, 31st December, 1879				18,404	10	4		
Surplus of Income over Expenditure during the Half-year, viz.:—								
Income	5,515	5	9					
Expenditure	4,352	11	1					
				1,162	14	8		
							19,567	5
Deduct half-year's interest and depreciation on Country Meeting Plant	..	..	..	..	..	..	237	15
							£19,329	10

UILTER BALL. CROSBIE, GLEGG, & WELTON, *Accountants.*

SOCIETY OF ENGLAND.

FROM 1ST JANUARY TO 30TH JUNE, 1880.

Cr.

	£	s.	d.	£	s.	d.	£	s.	d.
By Expenditure:—									
Establishment:—									
Salaries, Wages, &c.	692	10	0						
House:—Rent, Taxes, Repairs, &c.	443	13	1						
Office:—Printing, Postage, Stationery, &c.	258	0	8						
				1,394	3	9			
Journal:—									
Printing and Stitching	579	17	7						
Postage and Delivery	210	0	0						
Literary Contributions	56	10	0						
Woodcuts	1	15	0						
Printing 'Rot in Sheep'	62	12	0						
Paper on 'Rot in Sheep'	20	0	0						
Translating 'Hints on Butter Making' into Welsh	5	0	0						
				935	14	7			
Chemical:—									
Salaries	377	10	0						
Fittings for Laboratory, &c.	43	4	4						
Chemical Apparatus, &c.	54	6	0						
Petty Payments	30	0	0						
				505	0	4			
Veterinary:—									
The Brown Institution for Investigations to June 30, 1880	125	0	0						
Prizes and Medals	47	12	0						
Fees to Examiners	21	10	6						
				194	2	6			
Botanical:—									
Consulting Botanist's Salary				50	0	0			
Education:—									
Fees to Examiners	52	10	0						
Printing	13	1	0						
Prizes	135	0	0						
				200	11	0			
Subscriptions (paid in error) returned				2	0	0			
Sundries				4	0	0			
Farm Prizes:—									
Advertising, &c.				27	6	10			
London Exhibition				1,039	12	1			
Total Expenditure				..	..	..	4,352	11	1
By Carlisle Meeting				..	..	..	6,575	17	4
							10,928	8	5
By Balance in hand, 30th June:—									
Bankers				1,792	18	2			
Secretary				38	2	8			
							1,831	0	10
							£12,759	9	3

30TH JUNE, 1880.

ASSETS.	£	s.	d.	£	s.	d.
By Cash in hand	1,831	0	10			
By New 3 per Cent. Stock 12,430*l*. 7*s*. 0*d*. cost*	11,677	17	1			
By Books and Furniture in Society's House	1,451	17	6			
By Country Meeting Plant	2,932	6	11			
				17,893	2	4
At debit of Carlisle Meeting	..	..	..	1,436	7	8
				£19,329	10	0

* *Value at* 97 = 12,057*l*. 8*s*. 1*d*.

Mem.—The above Assets are exclusive of the amount recoverable in respect of arrears of Subscription to 30th June, 1880, which at that date amounted to 2481*l*.

Examined, audited, and found correct, this 30th day of August, 1880.

FRANCIS SHERBORN,
A. H. JOHNSON,
HENRY CANTRELL.
} *Auditors on behalf of the Society.*

CARLISLE MEETING,

1880.

STEWARDS OF DEPARTMENTS.

Implements.

W. Frankish.
Robert Neville.
Lord Vernon.

Stock.

Lt.-Col. Picton-Turbervill.
Charles Whitehead.
Charles Howard.
F. D. Dent.

Butter and Dairying.

G. M. Allender.

Forage.

Christopher Stephenson.

General Arrangements.

Jacob Wilson.

JUDGES OF STOCK.

HORSES, &c.

Agricultural and Suffolks.

Thomas Girling,
John Lumsden,
W. Wood.

Clydesdales.

D. McFarlane,
A. Mitchell,
Andrew Ralston.

Hunters.

Robert Arkwright,
Capt. J. H. Edwards Heathcote.
Robert G. F. Howard.

Hackneys.

John B. Booth,
Robert Clark,
George Higgins.

CATTLE.

Shorthorns.

[illegible] Beauford,
[illegible] W. Cruickshank
[illegible] Metcalfe

Herefords, Devons, Sussex, and Norfolk and Suffolk Polled.

William Hole,
George Napper,
John Price.

Longhorns and Dairy Cows.

Thomas Bowstead,
J. H. Burbery.

Jerseys and Guernseys.

Charles A. Barnes,
P. Marett.

Ayrshires.

Andrew Allen,
William Brakenridge.

Galloway.

Maxwell Clark,
Isaac Walton.

Polled Angus or Aberdeen.

Thomas Ferguson,
William Walker.

SHEEP.

Leicesters and Lincolns.

John P. Clark,
George H. Sanday.

Border Leicesters and Cheviots.

William Grieve,
George Torrance.

Cotswolds, Kentish, Romney Marsh, Devon, and other Long-woolled Breeds.

W. T. Garne,
J. Selmes.

Oxford Downs.

W. D. Little,
W. Parsons.

Southdowns, Hampshires, and other Short Wools.

George Jonas,
Hugh Penfold.

Shropshires.

C. R. Keeling,
Thomas Mansell.

Black-faced Mountain, Herdwick, and Lonk.

James Archibald,
Hugh P. Holme,
John Ingleby.

PIGS.

James Edwards,
Thomas Gibbons,
Samuel Walker.

INSPECTORS OF SHEARING.

William Jobson, | J. E. Rawlence, | J. B. Workman.

JUDGES OF BUTTER.

G. W. Burrows, | William Maxwell, | James Watson.

JUDGES OF IMPLEMENTS.

Steam Ploughing and Cultivating Machinery.

John Hemsley, | J. W. Kimber, | John Stephenson.

Miscellaneous.

Henry Cantrell. | Samuel Rowlandson, | John Wheatley.

JUDGES OF FARMS.

Herbert J. Little, | Thomas P. Outhwaite, | William J. Brown.

AWARDS OF PRIZES.

Note.—The Judges were instructed, in addition to awarding the Prizes, to designate as the *Reserve Number* one animal in each Class, next in order of merit, if it possessed sufficient for a Prize; in case an animal to which a Prize was awarded should subsequently become disqualified.

Prizes given by the Carlisle Local Committee are marked thus (*).

HORSES.

Agricultural Stallions—Four Years old and upwards.

The Earl of Ellesmere, Worsley Hall, Manchester: **First Prize, 40*l*.,** for "Admiral," bay, 4 years-old; bred by Mr. J. Milner, Treales, Kirkham; sire, "Honest Tom" (1105); dam by "British Ensign" (272).

The Stand Stud Company, Stand, Whitefield, Manchester: **Second Prize, 20*l*.,** for "Young Champion," chestnut, 13 years-old; bred by Mr. T. Stokes, Caldecot, Rockingham; sire, "Stokes's Champion;" dam, "Depper" by "King George."

Lawrence Drew, Merryton, Hamilton, Lanarkshire: the *Reserve Number* and *Highly Commended* for "Lord Harry," black, 6 years-old; bred by himself; sire, Drew's "Prince of Wales;" dam, "Mary."

Agricultural Stallions—Three Years old.

The Earl of Ellesmere, Worsley Hall, Manchester: **First Prize, 30*l*.,** for "Samson 4th," bay; bred by exhibitor; sire, "Samson" (1980); dam by "Honest Tom" (1105).

Captain William Hammond Betts, Frenze Hall, Diss, Norfolk: **Second Prize, 20*l*.,** for "Strawberry Wonder," roan; bred by Mr. Beart, Norfolk; sire, Marsters's "England's Wonder."

Agricultural Stallions—Two Years old.

The Earl of Ellesmere, Worsley Hall, Manchester: **First Prize, 30*l*.,** for "Worsley Wonder," bay; bred by Mr. J. Fryer, Chatteris, Cambs; sire, "British Wonder" (278); dam by "Honest Tom" (1121): and **Second Prize, 20*l*.,** for "Prime Minister," bay; bred by Mr. J. Tibbet, Doddington, Cambs; sire, "Lord Beaconsfield" (115); dam by "Matchless" (1531).

The Stand Stud Company, Stand, Whitefield, Manchester: **Third Prize,** 10*l.*, for "Crowland Hero," bay; bred by Mr. Horn, Frampton, Lincolnshire; sire, Gant's "Honest Tom;" dam by "Brown George."

Charles Marsters, Saddlebow, King's Lynn, Norfolk: the *Reserve Number* and *Highly Commended* for "West Norfolk Wonder," chestnut; bred by Mr. Hughes, Welshpool; sire, Marsters's "England's Wonder."

Clydesdale Stallions—Four Years old and upwards.

David Riddell, Blackhall, Paisley, N.B.: First Prize, 40*l.*, for "Darnley," bay, 8 years-old; bred by the late Sir W. Stirling Maxwell, Bart., Keir Mains, Dunblane, N.B.; sire, "Conqueror;" dam, "Peggie."

William Moffat, Blackford, Carlisle: Second Prize, 20*l.*, for "Prince Henry" (1257), bay, 4 years-old; bred by Mr. R. Willie, Machireoch, Campbeltown, N.B.; sire, "Prince David" (643); dam, "Maggie," by "Ploughboy (590): and Third Prize, 10*l.*, for "Young Baldie" (1353), bay, 7 years-old; bred by Mr. J. Henderson, Kelloeside, Sanquhar, Dumfriesshire; sire, "Garibaldi 3rd" (316).

The Bowness Entire Horse Company, Rogersceugh, Carlisle: the *Reserve Number* and *Highly Commended* for "Prince of Kirkbean," bay, 8 years-old; bred by Mr. Barbour, Gillfoot, Kirkcudbright; sire, "Lord Clyde," dam by "Merry Tom" (536).

Clydesdale Stallions—Three Years old.

Andrew Montgomery, Boreland, Castle Douglas, N.B.: First Prize, 30*l.*, for "Prince Imperial" (1258), brown; bred by Mr. J. Cunningham, Tarbreoch, Dalbeattie, N.B.; sire, "Dandy Jim" (221); dam, "Tarbreoch Jean" (75) by "Clansman" (150).

P. and J. Crawford, of Brydekirk Mains, Annan, N.B.: Second Prize, 20*l.*, for "Silver," bay; bred by Mr. Portaeous, Kirkland, Stranraer; sire, "Lord Lyon;" dam by "Clansman."

James Whyte, Aldboro' Hall, Darlington, Co. Durham: Third Prize, 10*l.*, for "Pointsman" (1236), bay; bred by exhibitor; sire, "Tam O'Shanter" (851); dam, "Rose," by "Lord Derby (485).

Clydesdale Stallions—Two Years old.

Andrew Montgomery, Boreland, Castle Douglas, N.B.: First Prize, 30*l.*, for "The MacGregor," bay; bred by Mr. R. Craig, Flashwood, Dalry, Ayrshire; sire, "Darnley" (222); dam, "Sally" (60) by "Prince Charlie" (629).

Andrew MacDowall, Auchtralme, Stranraer, Wigtownshire: Second Prize, 20*l.*, for "Collingwood," bright bay; bred by exhibitor; sire, "Glenlee," dam, "Nell," by "Farmer."

David Riddell, Blackhall, Paisley, N.B.: Third Prize, 10*l.*, for his bay; bred by the Marquis of Londonderry; sire, "What Care I;" dam, "Countess."

William Miller, Pond Cottage, Whitehouse, Aberdeenshire: the *Reserve Number* and *Highly Commended* for "Sefton," bay; bred by Mr. G. Wilson, Whiteside, Alford, N.B.; sire, "Victor;" dam, "Jane" by "Samson."

Suffolk Stallions—Four Years old and upwards.

Richard Garrett, Carleton Hall, Saxmundham, Suffolk: First Prize, 40*l.*, for "Cupbearer III." (566), chestnut, 6 years-old; bred by the late Mr.

C. Frost, Wherstead, Ipswich; sire, "Cupbearer II." (542); da "Stutton" (346) by "Sir Colin" (544).

Horace Wolton, Newbourn Hall, Woodbridge, Suffolk: **Second Prize, 2** for "Royalty" (1339), chestnut, 9 years-old; bred by exhibitor; si "Magnum Bonum" (1347); dam, "Duchess" (1332) by "Warric (1353).

Richard Garrett, Carleton Hall: **Third Prize, 10*l*.,** for "Crown Princ (564), chestnut, 7 years-old; bred by the late Mr. Blofield, Crown Far Leiston; sire, "Cupbearer" (565); dam, by Barker's "Goliath."

Suffolk Stallions—Three Years old.

Samuel Wolton, Butleigh Abbey, Wickham Market, Suffolk: **First Pri 30*l*.,** for "Chieftain" (1354), chestnut; bred by exhibitor; sire, "Cu bearer II." (542); dam, "Newbourn Princess" (1095), by "Warric (1353).

Richard Garrett, Carleton Hall, Saxmundham, Suffolk: **Second Prize, 20** for "Zulu," (571), chestnut; bred by exhibitor; sire, "Cupbearer II (566); dam, "Sprite" (345) by "Talbot" (378).

Horace Wolton, Newbourn Hall, Wordbridge: **Third Prize, 10*l*.,** f "Prince Royal" (1338), chestnut; bred by exhibitor; sire, "Royalty (1339); dam, "Darby" (1038).

Suffolk Stallions—Two Years old.

Horace Wolton, Newbourn Hall, Woodbridge, Suffolk: **First Prize, 30** for "Oriental" (1337), chestnut; bred by exhibitor; sire, "Royalty (1339); dam, "Newbourn Brag" (1035) by "Royal Duke II." (1366).

William Wilson, Baylham Hall, Ipswich: **Second Prize, 20*l*.,** for "Va guard," chestnut; bred by Mr. H. Biddell, Playford, Ipswich.

Robert E. Lofft, Troston Hall, Bury St. Edmunds, Suffolk: the *Reser Number* and *Highly Commended* for "Jove," chestnut; bred by exhibito sire, Lofft's "Young Cupbearer" (842); dam, "Maggie," by "You Hero."

Thoroughbred Stallions, suitable for getting Hunters.

The Stand Stud Company, Stand, Whitefield, Manchester: **First Prize, 50** for "Meteor," chestnut, 7 years-old; bred by Sir George Cholmley, Bo Rillington, Yorkshire; sire, "Volturno;" dam, "Meg" by "Ki Caradoc."

H. F. Clare Vyner, Newby Hall, Ripon, Yorkshire: **Second Prize, 25*l*.,** "Duc de Beaufort," chestnut, 11 years-old; bred by Count Lagrang sire, "Ventre St. Gris;" dam, "Dame d'Honneur" by "The Baron."

John Tait, High Street, Annan, N.B.: **Third Prize, 10*l*.,** for "Red Cap Sl chestnut, 8 years-old; bred by exhibitor; sire, "Sincerity;" da "Birkie" by "Le Maréchal."

Nicholas Robert Fleming, Normanby Hall, Middlesboro'-on-Tees, Yorkshi the *Reserve Number* to "The Muleteer," chestnut, 7 years-old; bred Mr. J. E. Bennett, Theddingworth, Rugby; sire, "Mogador;" da "Roma" by "Oxford."

Thoroughbred Stallions suitable for getting Hunters or Coach-Horse

William Taylor Sharpe, Baumber Park, Horncastle, Lincolnshire:

Given by Members of the Cumberland Hunt.

PRIZE of 105*l.* for "Merry Sunshine," bay, 10 years-old; bred by Mr. Merry, Russley Park, Hungerford; sire, "Thormanby;" dam, "Sunbeam" by "Chauticleer."

VILLIAM ARMSTRONG, Strickland Gate, Kendal, Westmoreland: the *Reserve Number* to "Westerhall," brown, 10 years-old; bred by Mr. J. Borthwick, Lyneholm, Langholm, N.B.; sire, "Laughing Stock;" dam, "Herie" by "Malcolm."

Stallions suitable for getting Coach-Horses.

HE STAND STUD COMPANY, Stand, Whitefield, Manchester: FIRST PRIZE, 25*l.*, for "Conservative," bay, 3 years-old; bred by Mr. W. J. Atkinson, Newland, Hull; sire, "Young Candidate;" dam by "Young Wyndham:" and SECOND PRIZE, 15*l.*, for "Liberal," bay, 4 years-old; bred by Mr. W. Dickinson, Stamford Bridge, Yorkshire; sire, "Roseberry;" dam by "Omar Pasha."

HRISTOPHER W. WILSON, High Park, Kendal: the *Reserve Number* to "Volunteer," rich bay, 3 years-old; bred by Mr. W. Taylor, Osgodby, Selby, Yorks.; sire, "Young Candidate;" dam by Mr. Swinbanks's "Paulinus."

tallions suitable for getting Hackneys above 14 hands and not exceeding 15 hands 2 inches.

OHN BURTON BARROW, Ringwood Hall, Chesterfield: FIRST PRIZE, 20*l.*, for "Young Perfection," brown, 6 years-old; bred by Mr. J. Utting, Melton Parva, Norwich; sire, "Old Perfection;" dam by "Don Carlos."

HRISTOPHER W. WILSON, High Park, Kendal: SECOND PRIZE, 10*l.*, for "Star of the Garter," bay, 5 years-old; bred by Mr. Cook, Thixendale; sire, "Bay President;" dam, "Evening Star" by "Wildfire."

HE STAND STUD COMPANY, Stand, Whitefield, Manchester: THIRD PRIZE, 5*l.*, for "Star of the East," chestnut, 8 years-old; bred by Mr. Cook, Thixendale, Yorkshire; sire, "Charley Merrylegs;" dam by "North Star."

VILLIAM FEATHERBY, Escrick, York: the *Reserve Number* to "Prince Arthur," chestnut, 3 years-old; bred by exhibitor; sire, "Gladstone;" dam, "Rose" by "Achilles."

Pony Stallions, above 13 hands 2 inches and not exceeding 14 hands 2 inches.

HRISTOPHER W. WILSON, High Park, Kendal: FIRST PRIZE, 15*l.*, for "Little Wonder," brown, 8 years-old; bred by Mr. Armes, Norfolk; sire, "Confidence:" SECOND PRIZE, 10*l.*, for "Lord Derby," brown, 6 years-old; bred by Mr. W. Coker, Walsingham, Norfolk; sire, "Perfection:" THIRD PRIZE, 5*l.*, for "Nobleman," black, 6 years-old; bred by Mr. Youngman, Wyndham, Norfolk; sire, "Confidence:" and the *Reserve Number* to "Sir Douglas," brown, 5 years-old; bred by Mr. E. Christian, Milntown, Ramsay, Isle of Man; sire, "Sir George."

Agricultural Mares and Foals.

HE EARL OF ELLESMERE, Worsley Hall, Manchester: FIRST PRIZE, 30*l.*, for "Damsel," brown, 7 years-old; bred by Mr. Colteman, Dry Doddington Lodge, Lincolnshire; sire, "Jericho Hero;" dam by Barnes's old "Roan Horse" (foal by "British Simon"): and the *Reserve Number* and *Highly*

Commended for "Flora," brown, 7 years-old; bred by Mrs. Millhous Sketchley Hall, Hinckley; sire, "A 1." (1). Foal by "Royal Georg (1892).

Clydesdale Mares and Foals.

David Riddell, Blackhall, Paisley, Renfrewshire: First Prize, 30*l*., for hi bay, 3 years-old; bred by exhibitor; sire, "Darnley;" dam, "Emma Foal by "Top Gallant."

Robert Fredrick, Drumflower, Dungarit, Wigtownshire: Second Prize, 20 for "Young Mary," bay, 7 years-old; bred by exhibitor; sire, "Princ Charlie;" dam, "Mary," by "Loch Fergus Champion." Foal by "Lor Lyon."

James Beattie, Newbie House, Annan, N.B.: Third Prize, 10*l*., f "Rosy," bay, 5 years-old; bred by Mr. Buchanan, Garscadden Main New Kilpatrick, N.B.; sire, "Prince Charlie" (629); dam, "Garscadde Maggie" by "General Williams" (327) (foal by "Baron Pollock"): an the *Reserve Number* and *Commended* for "Duchess," brown, 4 years-old bred by Mr. R. Wallace, Langbarns, Kirkcudbright; sire, "Farme (288); dam by "Lord Byron." Foal by "Pride of Galloway" (601).

Suffolk Mares and Foals.

The Duke of Hamilton and Brandon, K.T., Easton Park, Wickham Marke Suffolk: First Prize, 30*l*., for "Belle of the Ball," chestnut, 6 years-old bred by Mr. C. Frost, Wherstead; sire, "Son of May Duke;" dam b "Hero." Foal by "The Statesman."

Horace Wolton, Newbourn Hall, Woodbridge, Suffolk: Second Prize, 20*l*. for "Empress of Paris" (1033), chestnut, 6 years-old; bred by exhibitor sire, "Royal Duke II." (1366); dam, "Newbourn Pride" (1046) by Wolton's "Monarch" (1348). Foal by "Royalty" (1339).

The Duke of Hamilton and Brandon, K.T., Easton Park: Third Pri 10*l*., for "Bright Diamond," chestnut, 8 years-old; bred by Mr. C. Fros Wherstead; sire, Wolton's "Monarch;" dam, "Diamond" by "Son o Hero." Foal by "Cupbearer:" and the *Reserve Number* and *Highl Commended* for "Emerald," chestnut, 6 years-old; bred by Mr. E. Gra Parham Hall, Wickham Market; sire, Grout's "Emperor;" dam "Bragg" by "May Duke." Foal by "The Statesman."

Agricultural Mares—Four Years old.

Thomas H. Miller, Singleton Park, Poulton-le-Fylde, Lancashire: Firs Prize, 20*l*., for "Princess Dagmar," bay, 4 years-old; bred by exhibitor sire, "Honest Tom" (1105); dam, "Princess of Wales," by "Kin Alfred."

The Earl of Ellesmere, Worsley Hall, Manchester: Second Prize, 10 for "Lady Worsley," bay, 6 years-old; bred by Mr. Fullard, Thorney sire, "Wonder" (2357).

James Picken, Laigh Langside, Craigie, Kilmarnock: Third Prize, 5*l*., f "Young Darling," bay, 5 years-old: bred by Mr. McCulloch, Skait Newton Stewart, N.B.; sire, "Lord Lyon" (489); dam by "Lo Fergus Champion" (449).

Thomas H. Miller, Singleton Park: the *Reserve Number* and *Highly Co mended* for "Topsey" black, 6 years-old; bred by Mr. Goodhall, Milto Derby; sire, Crown Prince" (558).

Agricultural Fillies—Three Years old.

EDWARD HOLMES, Ingol House, Preston, Lancashire: FIRST PRIZE, 20*l.*, for "Lady Whitlock," chestnut; bred by Mr. J. Fairclough, Winn Farm, Out Rawcliffe, Garstang; sire, "What's Wanted;" dam, "Bute" by "Master of Parts."

ROBERT HORSLEY, Ashill, Thetford, Norfolk: SECOND PRIZE, 10*l.*, for "Duchess," chestnut roan; bred by Mr. Mercer, Manea, March; sire, "Duke."

THE EARL OF ELLESMERE, Worsley Hall: THIRD PRIZE, 5*l.*, for "Princess Victoria," bay; bred by Mr. J. D. Rose, Ramsey, Hunts; sire, "Samson;" dam by "Honest Tom" (1105).

JOHN FOX, Corless Mill, Ellel, Lancaster: the *Reserve Number* and *Highly Commended* for "Flower," bay; bred by exhibitor; sire, "Argyll;" dam, "Smiler" by "True Briton."

Clydesdale Fillies—Three Years old.

JOHN WADDELL, Inch, Bathgate, Linlithgow: FIRST PRIZE, 20*l.*, for "Louisa," brown; bred by Mr. Murcdoch, East Haughhead, Uddingston, N.B.; sire, "Darnley;" dam, "Bell" by "Young Campsie."

ANDREW McDOWALL, Auchtrolme, Stranraer, N.B.: SECOND PRIZE, 10*l.*, for "May Belle," bay; bred by exhibitor; sire, "Glenlee;" dam, "Nell" by "Farmer."

ROBERT LODER, Whittlebury, Towcester, Northamptonshire: THIRD PRIZE, 5*l.*, for "Darling 3rd," bay; bred by Mrs. Montgomery, Banks, Kirkcudbright; sire "Dandy Jim" (221); dam, "Darling 2nd" by "Loch Fergus Champion" (449).

JAMES BEATTIE, Newbie House, Annan, N.B.: the *Reserve Number* and *Highly Commended* for "Ada," light bay; bred by Colonel Williamson, Lawers, Crieff, N.B.; sire "Bothwell" (110); dam "Hannah" by "Sir Robert Bruce" (786).

Suffolk Fillies—Three Years old.

SAMUEL TOLLER, Letheringham Lodge, Wickham Market, Suffolk: FIRST PRIZE, 20*l.*, for "Princess" (930), chestnut; bred by exhibitor; sire, "Prince Imperial" (1239); dam, "Depper" (925) by "Canterbury Pilgrim" (85): and SECOND PRIZE, 10*l.*, for "Duchess" (298), chestnut, bred by exhibitor; sire, "Prince Imperial (1239); dam, "Scot 3rd" (932) by "Cupbearer" (416).

R. E. LOFFT, Troston, Bury St. Edmunds, Suffolk: the *Reserve Number* to "Gem," chestnut; bred by exhibitor; sire, "Lofft's Young Cupbearer" (842); dam "Diamond," by Wolton's "Champion" (1343).

Agricultural Fillies—Two Years old.

THE REV. VINCENT O. HOLCROFT, St. Mary's College, Oscott, Birmingham: FIRST PRIZE, 20*l.*, for "Empress," chestnut; bred by exhibitor; sire, "Wynn's Nonpareil;" dam, "Daisy."

RICHARD LAYCOCK, Winlaton, Blaydon-on-Tyne: SECOND PRIZE, 10*l.*, for "Beauty," chestnut; bred by exhibitor; sire, "All Glory;" dam, "Violet."

THE EARL OF ELLESMERE, Worsley Hall: THIRD PRIZE, 5*l.*, for "Thistle," chestnut, bred by Mr. Birkett, Flambro', Notts; sire, "Hydraulic" (1130); dam by Shepherd's "Admiral."

THE DUKE OF WESTMINSTER, K.G., Eaton, Chester: the *Reserve Numb* "Lively," bay brown; bred by Mr. J. Rowell, Manor Farm, Bury, Hu sire, "Honest Tom;" dam, "Diamond," by "Samson."

Clydesdale Fillies—Two Years old.

ROBERT MURDOCH, West Hallside, Newton, Glasgow: **FIRST PRIZE, 20l.** "Princess," bay, bred by Mr. A. McVicar, Woodend, Bathgate, N sire, "Prince of Renfrew" (664); dam "Susan."

SIR MICHAEL R. SHAW STEWART, BART., Ardgowan, Greenock, N.B.: **SE PRIZE**, 10*l*., for "Annot Lyle," bay; bred by Mr. J. Ross, Titw Dunlop, Aryshire; sire, "Young Lord Lyon" (994); dam, "Jean" "Loch Fergus Champion" (449).

LORD ARTHUR CECIL, Orchardmains, Innerleithen, N.B.: **THIRD PRIZE,** for "Kelpie," light bay; bred by Mr. J. McQueen, Crofts, Dalbeat sire, "Young Lord Lyon" (994); dam, "Darling" (340); by Lorne (4

WILLIAM MONTGOMERY, Banks, Kirkcudbright: the *Reserve Number Highly Commended* for "Mary Kate," brown; bred by exhibitor; "Young Prince of Wales" (1019); dam, "Darling" (268) by "Vi 2nd" (1338).

Suffolk Fillies—Two Years Old.

WILLIAM TOLLER, Gedgrave, Wickham Market, Suffolk: **FIRST PRIZE,** for "Shelduck" (943), chestnut; bred by exhibitor; sire, "Stand Bearer" (1207); dam "Scoter" (942) by Grout's "Emperor."

SAMUEL TOLLER, Letheringham Lodge, Wickham Market: **SECOND PR** 10*l*., for "Beacon" (942), chestnut; bred by exhibitor; sire, "Sta man" (657); dam "Depper" (925) by "Canterbury Pilgrim" (85).

*Agricultural Fillies—One Year Old.**

GEORGE SHADWICK, Aikton, Wigton, Cumberland: **FIRST PRIZE, 10l.,** "Darling," bay; bred by exhibitor; sire "Sovereign;" dam, "Fanny" "Walter Scott."

THOMAS H. MILLER, Singleton Park, Poulton-le-Fylde, Lancashire: **SECO PRIZE**, 5*l*., for "Meta," bay; bred by exhibitor; sire, "Lincoln" (135 dam, "Jewel," by "Honest Tom" (1105): and the *Reserve Number* "Satanella," black; bred by Mr. J. Cross, Pilling, Garstang; s "Lincoln" (1350).

*Clydesdale Fillies—One Year Old.**

JAMES BEATTIE, Newbie House, Annan, N.B.: **FIRST PRIZE, 10l.,** "Duchess," brown; bred by exhibitor; sire, "Dandy Jim" (221); d "Bess of Annandale" by "Clansman" (150).

SIR MICHAEL R. SHAW STEWART, BART., Ardgowan, Greenock: **SECOND PR** 5*l*., for "Leonora," bay, bred by Mr. J. Ross, Titwood, Dunlop, N. sire, "Young Lord Lyon" (994); dam, "Jean" by "Loch Fer Champion" (449).

RT MURDOCH, of West Hallside, Newton, Glasgow, the *Reserve Num* nd *Highly Commended*, for "Sheila," dark brown; bred by Mr. Williamson, Big Sypland, Kirkcudbright; sire, "Bonnie Scotlan dam, by "Victor."

Hunter Mares and Foals.

[illegible] HENRY HART, Dunnington Lodge, York: **FIRST PRIZE, 30l.**

Achievement," bay, 10 years-old; breeder unknown; sire, "Knowsley;" dam by "Laughing Stock." Foal by "Murillo."

THOMAS DIXON, Dalton Old Hall, Burton-in-Kendal, Westmoreland: SECOND PRIZE, 20*l.*, for "Fanny," bay, 12 years-old; bred by Mr. J. Maudsley, Newton Hall, Kirkby Lonsdale; sire "Mandracardo," dam, by "Dr. Sangrado." Foal by "Star of Ashton."

MARGARET HUMBLE, Carden, Dalston, Cumberland: THIRD PRIZE, 10*l.*, for "Kate," brown, 5 years-old; bred by Mr. T. Wills, Oughterby, Kirkbampton; sire, "Laughing Stock;" dam, "Dina" by "Contentment." Foal by "Lord of the Marches."

GEORGE THOMPSON CARR, Silloth Farm, Silloth, Cumberland: the *Reserve Number* to "Lizzie," chestnut, 14 years-old; bred by Mr. Brockbank, Moor Park, Maryport; sire, "Laughing Stock;" dam by "Charley-boy." Foal by "Gladstone."

Coaching Mares and Foals.

JOHN KIRBY, Burton Fields, Stamford Bridge, Yorkshire: FIRST PRIZE, 20*l.*, for "Flora," bay, 9 years-old; bred by Mr. Bilton, Mowthorp, Castle Howard; sire, "The Earl;" dam by "Aristocrat." Foal by "Conservative."

NORMAN STORDY, Thrustonfield, Carlisle: SECOND PRIZE, 10*l.*, for his bay, 7 years-old; bred by exhibitor; sire, "Lord of the Marches." Foal by "Ouragan 2nd."

JOHN WILSON HODGSON, Flatt, Kirkbampton, Carlisle: the *Reserve Number* to "Borealis," bay, 8 years-old; bred by exhibitor; sire, "Darlington;" dam, "Bay Leaf" by "Galaor." Foal by "Golden Horn."

Hackney Mares and Foals, above 14 *hands* 2 *inches and not exceeding* 15 *hands* 2 *inches.*

CHARLES LANCASTER, Kilgram Grange, Bedale, Yorkshire: FIRST PRIZE, 20*l.*, for "Maid of All Work," brown, 11 years-old; bred by Mr. Thompson, Hurworth, Darlington; sire, "The Norfolk Cob;" dam by "McOrville." Foal by "Ariel."

ROBERT MARTIN, Scoreby Grange, Flaxton, Yorkshire: SECOND PRIZE, 10*l.*, for "Lady Mary," bay, 10 years-old: bred by exhibitor: sire, "Sir Edwin Landseer;" dam, "Lady Superior" by "Sir Charles." Foal by Cook's "Phenomenon."

THOMAS H. MILLER, Singleton Park, Poulton-le-Fylde, Lancashire: THIRD PRIZE, 5*l.*, for "Belle," bay, aged; breeder unknown. Foal by "The Squire."

CHRISTOPHER W. WILSON, High Park, Kendal, Westmoreland: the *Reserve Number* and *Highly Commended* for "Little Wonder," bay, aged; breeder unknown. Foal by "Sir George."

Pony Mares and Foals, above 13 *hands* 2 *inches and not exceeding* 14 *hands* 2 *inches.*

CHRISTOPHER W. WILSON, High Park, Kendal: FIRST PRIZE, 15*l.*, for "Miss Constance," chestnut, 8 years-old; breeder unknown. Foal by "Star of the Garter."

WILLIAM TROTTER, South Acomb, Stocksfield-on-Tyne: SECOND PRIZE, 10*l.*, for "Lucy," bay, 10 years-old; breeder unknown. Foal by "Octavian."

CHRISTOPHER W. WILSON, High Park, Kendal
brown 7 years-old; breeder unknown.]

JOHN RUTHERFORD, Blackclough, Cowshill,
Reserve Number to "Jessie," bay, 11 yea
by "Earl Granville."

Pairs of Agricultural Horses—Four

JOHN WADDELL, Inch, Bathgate, Linlithgo
"Countess," brown, 6 years-old; bred l
field, Derby; sire, "Lofty." "Mary C
known.

THE EARL OF ELLESMERE, Worsley Hall, Ma
"Beauty," brown, 11 years-old; bred
Peterborough; sire, "Comet." "Diam
Mr. Odam, Farcet, Peterborough; sire, "

Agricultural Geldings—F

HENRY LAWSON, Chestnut House, Sutton-o
shire: FIRST PRIZE, 15*l.*, for "Clyde," c
Shipley, Dalton Bridge, Topcliffe, Thirsk
by "True Briton."

WILLIAM BELL, Milltown, Kirklinton, C
"Prince," bay; bred by exhibitor; sir
"Jess."

EDWARD CHARLTON, Shaw House, Stocksfi
THIRD PRIZE, 5*l.*, for "Prince," bay; bre
Jock;" dam, "Diamond" by "All Glo

Agricultural Geldings—Th

ROBERT BLAMIRE, Cumdivock, Dalton, C
for "Charlie," bay; bred by exhibitor; si
by "Old England's Glory."

RICHARD GRAHAM, Beck House, Scotby, C
"Ben," brown; breeder unknown; sire,
trooper."

Agricultural Geldings—T

GEORGE ARMSTRONG, Kirkland, Wigton, Cun
"Tom," bay; bred by Mrs. Barns, Gre
sire, "Simon Pure."

THOMAS H. MILLER, Singleton Park, Poulton
for his bay; bred by exhibitor; sire,
"Lofty."

THOMAS ROBINSON, Cargo, Carlisle: THIRD I
Mr. R. B. Faulder, Yew Tree, Carlisle; s

s MOFFAT, Crosby-on-Eden, Carlisle:
Richard," bay; bred by Mr. G. Bainbri
"Sovereign;" dam, "Rose."

Agricultural Colts or Gelding

MARSTERS, Saddlebow, King's Lyn

for "The Coming Wonder," chestnut colt; bred by Mr. Green, The Bank, Welshpool, Montgomeryshire.

JOHN WHITEHEAD, Medlar Hall, Kirkham, Lancashire: SECOND PRIZE, 5*l.*, for his black colt; bred by exhibitor; sire, "Lincoln;" dam, "Jessie" by "Sir Colin."

P. and J. CRAWFORD, Brydekirk Mains, Annan, Dumfries: the *Reserve Number* to "Queensberry," bay colt; bred by Mr. James McQueen, Crofts, Dalbeattie, Kirkcudbright; sire, "Pride of Clyde;" dam, "Sally."

*Clydesdale Colts or Geldings—One Year old.**

JOHN WADDELL, Inch, Bathgate, N.B.: FIRST PRIZE, 10*l.*, for his brown colt; bred by exhibitor; sire, "Prince Charlie;" dam, "Maggie" by "Galloway Bob."

JAMES MCQUEEN, Crofts, Dalbeattie, N.B.: SECOND PRIZE, 5*l.*, for "Robin Hood," bay colt; bred by exhibitor; sire, "Pride of Clyde" (600); dam, "Darling" (340) by "Lorne" (499).

JOHN M. MARTIN, Auchendennan Farm, Balloch, N.B.: the *Reserve Number* and *Highly Commended* for "Peter Peebles," bay colt; bred by exhibitor; sire, "Prince Charlie" (628); dam, "Ranee" (244) by "Black Prince" (52).

*Hunter Mares or Geldings, up to 15 stone—Five Years old and upwards.**

CHRISTOPHER W. WILSON, High Park, Kendal: FIRST PRIZE, 25*l.*, for "Rossington," bay gelding, 9 years-old; breeder unknown; sire, "Cain."

WILLIAM HENRY WAKEFIELD, of Sedgwick, Kendal, Westmoreland: SECOND PRIZE, 15*l.*, for "The Banker," bay gelding; 12 years-old; bred by exhibitor; sire, "Best Returns;" dam, "Sall" by "Emperor."

JOHN C. STRAKER, Stagshaw House, Corbridge-on-Tyne: THIRD PRIZE, 10*l.*, for "Gambler," chestnut gelding, 7 years-old; breeder unknown; sire, "Knave of Hearts."

JOHN METCALF, Prizett, Kendal: the *Reserve Number* and *Highly Commended* for "The Colonel," dark brown gelding, 6 years-old; bred by exhibitor; sire, "Best Returns;" dam, "Fanny."

*Hunter Mares or Geldings, up to 12 stone—Five Years old and upwards.**

JOHN BLENCOWE COOKSON, Meldon Park, Morpeth, Northumberland: FIRST PRIZE, 25*l.*, for "Old Boy," black gelding, 10 years-old; breeder unknown; sire, "Champagne."

JOHN RICKERBY, Wallhead, Carlisle: SECOND PRIZE, 15*l.*, for "Kate," chestnut mare, 6 years-old; bred by exhibitor; sire, "Laughing Stock;" dam, "Bony Kate" by "Clansman."

TOM MONKHOUSE CARLISLE, Tarraby, Carlisle: THIRD PRIZE, 10*l.*, for "Wallace," black gelding, 6 years-old; bred by Mr. R. Harrison, Thistlebottom, Caldbeck, Cumberland; sire, "Kingmoor."

JOHN BROWN, Wiggenby, Wigton, Cumberland: the *Reserve Number* and *Highly Commended* for "Baronet," brown gelding, 6 years-old; bred by exhibitor; sire, "Motley;" dam by "Galaor."

*Hunter Mares or Geldings—Four Years old.**

FRANCIS JOHN SNOWBALL, Seaton Burn House, Dudley, Northumberla FIRST PRIZE, 20*l.*, for "Flower Girl," chestnut mare; bred by the Mr. G. Easby, Wilstrop, Yorkshire; sire, "Highthorn;" dam by " Fours."

TEASDALE HILTON HUTCHINSON, Manor House, Catterick, Yorkshire: Sec PRIZE, 10*l.*, for "Wincsour," black gelding; bred by Mr. Barker, At Hill, Cowton, Yorks.; sire, "East Coast."

WILLIAM ANDERSON, Houghton, Carlisle, Cumberland: THIRD PRIZE, for "The Mystery," chestnut gelding; bred by Mr. Mulcahy, Ba nooran, Clonmel, Ireland; sire, "The Fenian;" dam by "Tipple Cid

JOHN STOCKDALE, of New Cooper, Aspatria, Cumberland: the *Reserve Num* and *Highly Commended* for "Polly Perkins," dark-brown mare; l by Mr. W. Parkin, Blaithwaite, Aspatria; sire, Kingmoor; dam, "Jud

*Hunter Mares or Geldings—Three Years old.**

THOMAS DIXON, Dalton Old Hall, Burton-in-Kendal, Westmoreland: Fi PRIZE, 15*l.*, for "May Fly," black brown gelding; breeder unkno sire, "Loaf Sugar;" dam by "Sincerity."

FRANCIS JOHN SNOWBALL, Seaton Burn House, Dudley, Northumberla SECOND PRIZE, 10*l.*, for "Æolus," dark brown gelding; bred by Col Hall, Highington, co. Durham; sire, "East Coast;" dam by "Fathe the Turf."

MARY ELIZABETH TYSON, the Manor House, Dalton-in-Furness, Lancash THIRD PRIZE, 5*l.*, for "Juliet," bay mare; bred by exhibitor; s "Gamester;" dam by "The Abbot."

THOMAS ROBSON, Cundall Lodge, Boroughbridge, Yorkshire: the *Res Number* and *Highly Commended* for "Cyprian," black gelding; bred exhibitor; sire, "Highthorn;" dam, "Queen of Spades" by "King Hearts."

*Hunter Mares or Geldings—Two Years old.**

JOHN CASTLEHOW TOPPIN, Musgrave Hall, Skelton, Cumberland: Fi PRIZE, 10*l.*, for "Clarion," bay gelding; bred by exhibitor; sire "Cl mont;" dam "Jewel" by "British Yeoman."

THOMAS DIXON, Dalton Old Hall, Burton-in-Kendal, Westmoreland: Sec PRIZE, 5*l.*, for "Miss Fanny," bay filly; bred by exhibitor; s "Redbourne;" dam, "Fanny" by "Mandracardo."

RICHARD HAWKRIDGE, 2, South Crescent, Ripon, Yorkshire: the *Res Number* and *Highly Commended* for "Newby," black gelding; bred exhibitor; sire, "Duc de Beaufort;" dam, "Fanny" by "Despatch."

*Hunter Mares, Colts, or Geldings—One Year old.**

OMAS HEATH FODEN, Givendale Grange, Boroughbridge, Yorkshire: F PRIZE, 10*l.*, for "The Marquis," chestnut colt; bred by exhibitor; Duc de Beaufort;" dam, "Bright Eyes" by "Rataplan."

[illegible] WILSON HODGSON, Flatt, Kirkbampton, Carlisle: SECOND PRIZE, or "Rose of Athol," bay filly; bred by exhibitor; sire, "Claremo dam "Borealis" by "Darlington."

MARY ANN BELL, Horsegills, Kirklinton, Carlisle: the *Reserve Number* and *Highly Commended* for "Jack," chestnut gelding; bred by exhibitor; sire, "Ouragan 2nd;" dam, "Kate."

*Coaching Mares or Geldings—Four Years old and upwards.**

MESSRS. CARLISLE AND BELL, 6, Lonsdale Street, Carlisle: FIRST PRIZE, 15*l.*, for "The General," bay gelding, 5 years-old; bred by Mr. J. Graham, Holme Gate, Carlisle; sire, "General Benefit."

JOHN METCALF, Prizett, Kendal, Westmoreland: SECOND PRIZE, 10*l.*, for "The Major," dark brown gelding, 7 years-old; bred by exhibitor; sire, "Best Returns;" dam, "Fanny."

WILLIAM BELL, Thomas Close, Penrith, Cumberland: THIRD PRIZE, 5*l.*, for "Prince," dark grey gelding, 6 years-old; bred by exhibitor; sire, "British Prince;" dam by "Galaor."

GEORGE HODGSON, Lavrickstone House, Kirkbampton, Carlisle: the *Reserve Number* to "Baronet," bay gelding, 4 years old; bred by exhibitor; sire, "Fisherman."

Coaching Mares or Geldings—Three Years old.

JOHN KIRBY, Burtonfields, Stamford Bridge, Yorkshire: FIRST PRIZE, 15*l.*, for "Duke of Connaught," bay gelding; bred by Mr. T. Dickinson, Acres House, Naburn, Yorks.; sire, "Selby;" dam by "Belthorp Paulinus."

JOHN GRAINGER, Fenton, How Mill, Cumberland: SECOND PRIZE, 10*l.*, for his dark brown gelding; bred by exhibitor; sire, "Golden Horn;" dam, "Jean" by Laughing Stock."

THOMAS BACKHOUSE, Newton Arlosh, Silloth, Cumberland: the *Reserve Number* to "Sir Garnet," bay gelding; bred by exhibitor; sire, "Ouragan 2nd;" dam, "Borealis" by "Darlington."

*Coaching Mares or Geldings—Two Years old.**

WILLIAM BLAND, Lancaster: FIRST PRIZE, 10*l.*, for his dark brown filly; bred by exhibitor; sire, Rococo.

THE NEW STUD COMPANY, Burgh-by-Sands, Carlisle: SECOND PRIZE, 5*l.*, for "Princess," bay filly; bred by Mr. J. Hodgson, Kirkbampton, Carlisle; sire, "Ouragan 2nd;" dam, "Borealis" by "Darlington."

HENRY FEARON MONCRIEF, Sosgill, Cockermouth, Cumberland, the *Reserve Number* to "King Charles," chestnut gelding; bred by Mr. J. R. Williamson, Pardshaw, Cockermouth; sire, "Kingmoor."

Hackney Mares or Geldings, exceeding 15 *hands up to not less than* 15 *stone.**

CHRISTOPHER W. WILSON, High Park, Kendal, Westmoreland: FIRST PRIZE, 20*l.*, for "Lady Walton," brown mare, 6 years-old; bred by Mr. Stiraker, Walton, Yorks.; sire, "Denmark;" dam by "Old Rattler."

Hackney Mares or Geldings, exceeding 15 *hands, up to not less than* 12 *stone.**

CHRISTOPHER W. WILSON, High Park, Kendal, Westmoreland: FIRST PRIZE, 20*l.*, for, and SECOND PRIZE, 10*l.*, for "Lady Silvertail," roan mare, 7 years-old; breeder unknown; sire, "Denmark": and THIRD PRIZE, 5*l.*, for

"Sunbeam," bay gelding, 9 years-old; breeder unknown; sire, "Ba President."

Silas George Saul, Millhouse, Carlisle: the *Reserve Number* to "Norm, chestnut mare, 6 years-old; bred by Mr. T. Jefferson, Hall Flate, Scaleby, Carlisle; sire, "Kingmoor;" dam by "Laughing Stock."

*Hackney Mares or Geldings, above 14 and not exceeding 15 hands, up to 15 stone.**

Christopher W. Wilson, High Park, Kendal, Westmoreland: **First Pri** 20*l.*, for "Charles 3rd," chestnut gelding, 5 years-old; bred by Mr. Crompton, Thornholm, Burton Agnes, Yorks.; sire, "Denmark;" dam b "St. Giles."

John Cargill, Crown Hotel, Langholm, Dumfriesshire: the *Reserve Numb* to "Eskdale," brown gelding, 6 years-old; bred by Mr. Hill, Crossland Ecclefechan, Dumfries.

*Hackney Mares or Geldings, above 14 and not exceeding 15 hands up to 12 stone.**

John Robinson, Cleveland House, Coltman Street, Hull, Yorks: **First Pri** 20*l.*, for "Warter Lily," dark chestnut mare, 4 years-old, bred by M Rickell, Warter Wold, Pocklington, Yorkshire; sire, "Denmark;" da by "General Giles."

Francis Cook Matthews, Easterfield House, Driffield, Yorkshire: **Secon Prize**, 10*l.*, for "Zephyr," roan mare, 5 years-old; bred by Mr. Moor Burn Butts, Cranswick, Hull; sire, Triffett's "Fireaway."

William Boulton, Springfield, Ulverstone, Lancashire: **Third Prize**, 5*l.*, f his chestnut gelding, 5 years-old; bred by Captain Porter, Newbarn Barrow-in-Furness; sire, "Abbot."

Christopher W. Wilson, High Park, Kendal: the *Reserve Number* to "Ro in Pickle," brown mare, 5 years-old; breeder unknown; sire, "Fireaway.

*Pony Mares or Geldings, above 13 and not exceeding 14 Hands.**

William Foster, Grove Villas, Pontefract, Yorkshire: **First Prize**, 15*l.*, "Novelty," brown gelding, 7 years-old; breeder unknown.

John Robinson, Cleveland House, Coltman Street, Hull: **Second Prize**, 10 for "Lord Silvertail," brown roan gelding, 5 years-old; bred by Stubbs, Clifton, Yorkshire; sire, "Denmark."

Christopher W. Wilson, High Park, Kendal: **Third Prize**, 5*l.*, for "Lit Jack," bay gelding, 5 years-old; breeder unknown; sire, "Confidence."

James Moffatt, Crosby-on-Eden, Carlisle: the *Reserve Number* "Emma," chestnut mare, 5 years-old; bred by the late Mr. Ar strong, Cross Hill, Carlisle, Cumberland; sire, "British Monk;" da "Maggie."

*Pony Mares or Geldings, above 12 and not exceeding 13 Hands.**

liam Foster, Grove Villas, Pontefract, Yorkshire: **First Prize**, 15*l.* Vendor" bay gelding, 7 years-old; breeder unknown.

Joseph Clementson, Pringle House, Skelton, Penrith, Cumberland: **Second Prize**, 10*l.*, for "Captain," bay gelding, 4 years-old; bred by Mr. G. Nelson, Dale Head, Martindale, Westmoreland; sire, "Stainmore Hero;" dam, "Nelly."

William Laing, St. James's Road, Carlisle: **Third Prize**, 5*l.*, for "Prince," brown gelding, 3 years-old; bred by exhibitor; sire, "Jack's Delight;" dam, "Fanny."

Andrew Dobie, Becton, Lockerbie, N.B.: the *Reserve Number* to "Deoynock," brown gelding, 5 years-old; bred by exhibitor; dam, "Black Bess."

Pony Mares or Geldings, not exceeding 12 *Hands.**

William Foster, Grove Villas, Pontefract, Yorkshire: **First Prize**, 10*l.*, for "Prince," chestnut gelding, 7 years-old; breeder unknown.

John Blencowe Cookson, Meldon Park, Morpeth, Northumberland: **Second Prize**, 5*l.*, for "Tommy," black gelding, 5 years-old; bred by the Marquis of Londonderry, Seaham, Durham.

John Robinson, Spencer Street, Carlisle: the *Reserve Number* to "Mop," dark chestnut gelding, 10 years-old; breeder unknown.

CATTLE.

Shorthorn Bulls above Three Years old.

John Vickers, Mown Meadows, Crook, Durham: **First Prize**, 30*l.*, and the **Champion Prize** of 25*l.*,† for "Duke of Howl John" (33,674), white, 6 years, 2 months, 3 weeks, 2 days-old; bred by Messrs. Vickers, Howl John, Stanhope, Durham; sire, "White Duke" (32,849); dam, "Belle Cœur-de-Lion," by "Knight of Richard Cœur-de-Lion" (20,080); g. d., "Belle Vue," by "Baron Stapleton" (15,627); gr. g. d., "Red Rosette" by "Royal Buck" (10,750); gr. g. g. d., by "Hamlet" (8126).

Thomas Willis, Jun., Manor House, Carperby, Bedale, Yorkshire: **Second Prize**, 20*l.*, for "Vice-Admiral" (39,257), roan, 3 years, 10 months, 1 week, 5 days-old; bred by exhibitor; sire, "Admiral Windsor" (32,912); dam, "Windsor's Hyacinth," by "Windsor's Prince" (32,164); g. d., "Camelia Windsor," by "Windsor Fitz-Windsor" (25,458); gr. g. d., "Camelia," by "Royal Alfred" (18,748); gr. g. g. d., "Mayflower," by "Knight of the Garter" (13,124).

The Earl of Ellesmere, Worsley Hall, Manchester: **Third Prize**, 15*l.*, for "Attractive Lord" (32,968), red and white, 6 years, 1 month, 1 day-old; bred by Mr. T. Pears, Hackthorne, Lincoln; sire, "Knight of Killerby" (28,999); dam, "Attraction," by "Robin" (24,968); g. d., "Alice Buckingham," by "Royal Buckingham" (20,718); gr. g. d., "Anna Maria," by "Sir Roger" (16,991); gr. g. g. d., "Adelaide," by "The Squire" (12,217).

John Relph, Maulds Meaburn Hall, Shap, Westmoreland: **Fourth Prize**, 10*l.*, for "Bright Duke" (37,892), dark roan, 4 years, 1 month, 5 days-old; bred by Messrs. Dudding, Panton House, Wragby, Lincolnshire;

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† Given by S. P. Foster, Esq., for the best Shorthorn Bull in the Show.

sire, "Pluto" (35,050); dam, "Bright Duchess," by "**Grand Duke** 15t
(21,852); g. d., "Bright Halo," by "**Breast Plate**" (19,337); gr. g.
"Bright Dew," by "British Prince" (14,197); gr. g. g. d., "Brig
Morn," by "Vanguard" (10,994).

THOMAS WILLIS, Jun., Manor House, Carperby, Bedale, Yorkshire:
Reserve Number and *Highly Commended* for "Rear-Admiral" (37,31
roan, 5 years, 3 weeks, 2 days-old; bred by exhibitor; sire, "Admi
Windsor" (32,912); dam, "Windsor's Hyacinth," by "Windsor's Prin
(32,164); g. d., "Camelia Windsor," by "Windsor Fitz-Winds
(25,458); gr. g. d., "Camelia," by "Royal Alfred" (18,748); gr. g. g.
"Mayflower," by "Knight of the Garter" (13,124).

Shorthorn Bulls above Two and not exceeding Three Years old.

THOMAS NELSON, Bewaldeth, Keswick, Cumberland: FIRST PRIZE, 25*l.*,
"Prince Imperial" (42,184), roan, 2 years, 3 weeks, 1 day-old; bred
Mr. Thomas Lambert, Elrington Hall, Haydon Bridge, Northumberla
sire, "Prince Regent" (29,676); dam, "White Socks," by "Beaut
Butterfly (23,399); g. d., "Trip the Daisy," by "Ivanhoe" (14,73
gr. g. d., "Splendour," by "Snowy Down" (8607); gr. g. g. d. "Angel
by "Prince Albert" (4778).

WILLIAM HANDLEY, Green Head, Milnthorpe, Westmoreland: SECOND PR
15*l.*, for "Master Harbinger" (40,324), roan, 2 years, 7 months, 1 we
6 days-old; bred by exhibitor; sire, "Alfred the Great" (32, 121); da
"Earl's Flora," by "Earl of Eglinton" (23,832); g. d., "Flora Cobha
by "Marquis of Cobham" (22,299); gr. g. d., "Flower of Fitz-Clarenc
by "Alfred Fitz-Clarence" (19,215); gr. g. g. d., "Miss Nicety,"
"Veteran" (13,941).

THOMAS WILLIS, Jun., Manor House, Carperby, Bedale: THIRD PRIZE, 10*l.*,
"Flag Officer" (39,882), white, 2 years, 7 months, 1 week, 5 days-ol
bred by exhibitor; sire, "Rear-Admiral" (37,310); dam, "Bash
Bride," by "K.C.B" (26,492); g. d., "Blushing Bride," by "Fi
Clarence" (14,552); gr. g. d., "Maiden's Blush," by "Gipsy Kin
(11,352); gr. g. g. d., "Maid of Masham," by "Bernardo" (8885).

ROBERT TAYLOR, Crosby Lodge, Crosby Ravensworth, Westmoreland: TH
PRIZE, 10*l.*, for "Prince Louis," rich roan, 2 years, 3 months, 3 wee
1 day-old; bred by Lord Moreton, Tortworth Court, Gloucestershi
sire, "Oxford's Prince" (34,998); dam, "Lady Louisa's Duchess 6t
by "Sixth Duke of Oneida" (30,997); g. d., "Lady Louisa's Duch
4th," by "Grand Duke 15th" (21,852); gr. g. d., "Lady Louisa,"
"Archduke 2nd" (15,588); gr. g. g. d., "Lucy Long," by "Duke
Glo'ster" (11,382).

THE DUKE OF RICHMOND AND GORDON, K.G., Gordon Castle, Fochabers, N.
the *Reserve Number* and *Highly Commended* for "Arthur Benedic
(40,986), roan, 2 years, 4 months, 3 weeks, 5 days-old; bred by Mr.
Linton, Sheriff Hutton, York; sire, "Paul Potter" (38,854); da
"Maleta," by "Sir Arthur Ingram" (32,490); g. d., "Maid of Honou
by "Sergeant Major" (29,959); gr. g. d., "White Rose," by "Mag
Troil" (14,880); gr. g. g. d., "Miss Henderson," by "Magnus Tro
(14 880).

Shorthorn Yearling Bulls, above One and not exceeding Two Years o

THOMAS TOWNELEY TOWNELEY-PARKER, Cuerdon Hall, Preston, Lancashi
FIRST PRIZE, 25*l.*, for "Oxford Rose," roan, 1 year, 9 months, 3 wee
1 day-old; bred by Mr. J. J. Sharpe Broughton, Kettering; sire, "Ba

Shendish 2nd" (41,061); dam, "Julia 15th," by "Claro's Rose" (25,784); g. d., "Julia 11th," by "Satan" (27,430); gr. g. d., "Julia 9th," by "Lord Chancellor" (20,160); gr. g. g. d., "Julia 1st," by "Henry 5th" (19,944).

DAVID PUGH, Manoravon, Llandilo, Carmarthenshire: SECOND PRIZE, 15*l.*, for "Sir Charles," red and little white, 1 year, 9 months, 3 weeks, 6 days-old; bred by Mr. Hugh Aylmer, West Dereham Abbey, Stoke Ferry, Norfolk; sire, "Sir Wilfrid" (37,484); dam, "Lady Mayoress," by "High Sheriff" (26,392); g. d., "Lady Leonora 2nd," by "Emperor of the North" (23,888); gr. g. d., "Lady Leonora," by "Sir Samuel" (15,302); gr. g. g. d., "Lady Leonora," by "Prince Alfred" (13,494).

SAMUEL PORTER FOSTER, Killhow, Mealsgate, Carlisle: THIRD PRIZE, 10*l.*, for "Oxford Duke of Killhow 2nd," roan, 1 year, 4 months, 3 weeks, 4 days-old; bred by exhibitor; sire, "Duke of Ormskirk" (36,526); dam, "Grand Duchess of Oxford 18th," by "Baron Oxford 4th" (25,580); g. d., "Grand Duchess of Oxford 11th," by "Grand Duke 10th (21,848); gr. g. d., "Grand Duchess of Oxford 5th," by "Priam" (18,567); gr. g. g. d., "Countess of Oxford," by "Earl of Warwick" (11,412).

JOSEPH AND DANIEL DIXON LAZONBY, Calthwaite House, Calthwaite, Penrith: FOURTH PRIZE, 5*l.*, for "Royal Windsor," dark roan, 1 year, 8 months, 2 days-old; bred by exhibitors; sire, "Bright Duke" (37,893); dam, "Lady Windsor," by "Royal Fantail" (32,383); g. d., "Ormolu Alexandra Windsor," by "Prince of Wales" (24,851); gr. g. d., "Ormolu Windsor," by "Imperial Windsor" (18,086); gr. g. g. d., "Ormolu Gwynne," by "Master Hopewell" (14,929).

JOHN OUTHWAITE, Bainesse, Catterick, Yorkshire: the *Reserve Number* and *Highly Commended* for "Lord Zetland," roan, 1 year, 2 months, 2 weeks, 5 days-old; bred by the Earl of Zetland, Aske Hall, Richmond, Yorkshire; sire, "Royal Windsor" (29,890); dam, "Florella," by "George Peabody" (28,710); g. d., "Floss," by "Windsor Augustus" (19,157); gr. g. d., "Flirt," by "Cobham" (14,287); gr. g. g. d., "Wood Nymph," by "Ravensworth" (10,681).

Shorthorn Bull Calves, above Six and not exceeding Twelve Months old.

TEASDALE HILTON HUTCHINSON, Manor House, Catterick, Yorkshire: FIRST PRIZE, 20*l.*, for "Knight of Kars," red and white, 8 months, 1 week, 5 days-old; bred by exhibitor; sire, "British Knight" (33,220); dam, "Lady Graceless," by "M. C." (31,898); g. d., "Lady Grace," by "K. C. B." (26,492); gr. g. d., "Lady Graceful," by "Knight Errant" (18,154); gr. g. g. d., "Lady of the Manor," by "Baron Warlaby" (7813).

JOHN STRONG, Culgaith, Penrith, Cumberland: SECOND PRIZE, 15*l.*, for "Goldsmith," white, 7 months, 3 weeks, 5 days-old; bred by exhibitor; sire, "Earl of Doune" (36,579); dam, "White Baroness," by "Pure Gold" (32,226); g. d., "Baroness," by "Edwin" (26,171); gr. g. d., "Kickie," by "Young Baronet" (33,038); gr. g. g. d., by "Rejected" (15,399).

MRS. ELIZABETH A. FOTHERGILL, Uldale Hall, Carlisle: THIRD PRIZE, 10*l.*, for "St. Swithin," roan, 11 months, 2 weeks, 2 days-old; bred by Mr. John Fothergill, Uldale Hall, Carlisle; sire, "Wetherby Winsome" (35,971); dam, "Seraphina 28th," by "Eighth Duke of York" (28,480); g. d., "Seraphina 25th," by "Eighth Duke of York" (28,480); gr. g. d., "Seraphina 19th," by "Imperial Oxford" (18,034); gr. g. g. d., "Seraphina 11th," by "May Duke" (13,320).

Benjamin St. John Ackers, Prinknash Park, Painswick, Gloucestershire: Fourth Prize, 5*l.*, for "Lord George Hamilton," roan, 10 months, 1 week, 5 days-old; bred by exhibitor; sire, "Lord Prinknash 2nd (38,653); dam, "Princess George," by "County Member" (28,268 g. d., "Georgie's Queen," by "Brigade Major" (21,312); gr. g. d. "Georgie," by "Prince George" (13,510); gr. g. g. d., "Hopeful," by "Hopewell" (10,332).

William Handley, Green Head, Milnthorpe, Westmoreland: the *Reser Number* and *Commended* for "Crown Prince," white, 9 months, 5 days-old; bred by exhibitor; sire, "Alfred the Great" (36,121); dam "Nicety," by "Earl of Derwent" (28,503); g. d., "Earl's Flora," by "Earl of Eglinton" (23,832); gr. g. d,, "Flora Cobham," by Marquis o Cobham" (22,299); gr. g. g. d., "Flower of Fitzclarence," by "Alfre Fitz-Clarence" (19,215).

Shorthorn Cows, in-milk or in-calf, above Three Years old.

Teasdale Hilton Hutchinson, Manor House, Catterick, Yorkshire: Firs Prize, 20*l.*, for "Grateful," roan, 7 years, 6 months, 5 days-old, in-milk calved Feb. 1st, 1880, and in-calf; bred by exhibitor; sire, "M. C. (31,898); dam, "Gerty 3rd," by "Knight of the Shire" (26,552); g. d. "Gerty," by "Vain Hope" (23,102); gr. g. d., "Garland," by "Gran Master" (24,078); gr. g. g. d., "Bridget," by "Highthorn" (13,028).

Benjamin St. John Ackers, Prinknash Park, Painswick, Gloucestershire: Second Prize, 15*l.*, for "Princess Georgie," roan, 5 years, 11 months-old, in-milk, calved August 19th, 1879; bred by exhibitor; sire, "County Member" (28,268); dam, "Georgie's Queen," by "Brigade Major" (21,312); g. d., "Georgie," by "Prince George" (13,510); gr. g. d., "Hopeful," by "Hopewell" (10,332); gr. g. g. d., by "Warrior" (12,287).

The Earl of Tankerville, Chillingham Castle, Alnwick, Northumberland: Third Prize, 10*l*, for "Gaiety 3rd," roan, 5 years, 3 days-old, in-milk, calved Nov. 18th, 1879, and in-calf; bred by Mr. George Angus, o Broomley, Stocksfield-on-Tyne; sire, "Ben Brace" (30,524); dam, "Gaiety," by "Merry Monarch" (22,349); g. d., "Rachel," by "Monarch' (18,412); gr. g. d., "Young Matchless," by "Duke of Tyne (12,773); gr. g. g. d., "Matchless," by "Young Hector" (7074).

William Langhorn, East Mill-Hills, Haydon Bridge, Northumberland: Fourth Prize, 5*l.*, for "Diadem 2nd," roan, 4 years, 5 months, 2 weeks 2 days-old, in-milk, calved May 10th, 1879, and in-calf; bred by Mrs. Eshton, Chesterwood Grange, Haydon Bridge; sire, "Lucky Lad (34,714); dam, "Diadem 1st," by "Wild Boy" (25,447); g. d., "Dinah 4th," by "Pizarro" (20,497); gr. g. d., "Dinah 3rd," by "Master Annandale" (14,916); gr. g. g. d., "Dinah 2nd," by "Earl" (13,850).

The Duke of Northumberland, Alnwick Castle, Northumberland: th *Reserve Number* and *Highly Commended* for "Lady Jane," roan, 3 years 9 months, 2 weeks-old, in-milk, calved April 6th, 1880; bred by exhibitor; sire, "Fitz-Roland" (33,936); dam, "Janet," by "Mayor o Windsor" (31,897); g. d., "Young Dairymaid," by "Foxton" (23,979) gr. g. d., "Dairymaid," by "Melsonby" (18,380); gr. g. g. d., "Youn Jessy," by "George 3rd" (16,147).

Shorthorn Heifers, in-milk or in-calf, not exceeding Three Years old.

DALE H. Hutchinson, Manor House, Catterick, Yorkshire: First Priz

20*l.*, for "Gainful" roan, 2 years, 8 months, 1 week, 2 days-old, in-calf; bred by exhibitor; sire, "King Alfonso" (36,832); dam, "Grateful," by "M. C." (31,898); g. d., "Gerty 3rd," by "Knight of the Shire" (26,552); gr. g. d., "Gerty," by "Vain Hope" (23,102); gr. g. g. d., "Garland," by "Grand Master" (24,078).

William Langhorn, East Mill-Hills, Haydon Bridge, Northumberland: Second Prize, 15*l.*, for "Lady Anne," roan, 2 years, 6 months, 2 weeks, 2 days-old, in-calf; bred by Mrs. Eshton, Chesterwood Grange, Haydon Bridge; sire, "Prince Regent" (29,676); dam, "Diadem 1st," by "Wild Boy" (25,447); g. d., "Dinah 4th," by "Pizarro" (20,497); gr. g. d., "Dinah 3rd," by "Master Annandale" (14,916); gr. g. g. d., "Dinah 2nd," by "Earl" (13,850).

David Pugh, Manoravon, Llandilo, Carmarthenshire: Third Prize, 10*l.*, for "Tulip 4th," roan, 2 years, 4 months, 5 days-old, in-calf; bred by exhibitor; sire, "Falmouth" (38,268); dam, "Tulip," by "Prince of the Empire" (20,578); g. d., "Topsy," by "Briton" (17,463); gr. g. d., "Tabby," by "Puritan" (20,614); gr. g. g. d., "Topsy 2nd," by "General" (16,100).

James Whyte, Aldborough Hall, Darlington: Fourth Prize, 5*l.*, for "Gaiety 6th," roan, 2 years, 1 month, 1 week-old, in-calf; bred by the executors of Mr. G. Angus Broomley, Stocksfield-on-Tyne; sire, "Ben Brace" (30,524); dam, "Gaiety," by "Merry Monarch" (22,349); g. d., "Rachel," by "Monarch" (18,412); gr. g. d., "Young Matchless," by "Duke of Tyne" (12,773); gr. g. g. d., "Matchless," by "Young Hector" (7074).

Evan Baillie, Dochfour, Inverness, N.B.: the *Reserve Number* and *Highly Commended*, for "Sweet Pea," red and white, 2 years, 5 months, 2 weeks, 4 days-old, in-calf; bred by exhibitor; sire, "Oliver Cromwell;" dam, "Pretty Gold," by "Flower of the Forest" (33,948); g. d., "Marigold 13th," by "Gold Digger" (24,044); gr. g. d., "Marigold 6th," by "Young Pacha" (34,057); gr. g. g. d., "Marigold 2nd," by "Lord of Lorn" (18,258).

Shorthorn Yearling Heifers, above One and not exceeding Two Years old.

Lord Fitzhardinge, Berkeley Castle, Gloucestershire: First Prize, 20*l.*, for "Lady Wild Eyes 15th," red and white, 1 year, 10 months, 1 week-old, in-calf; bred by exhibitor; sire, "Duke of Connaught" (33,604); dam, "Lady Wild Eyes 6th," by "Second Duke of Tregunter" (26,022); g. d., "Lady Wild Eyes 3rd," by "Cherry Grand Duke" (23,554); gr. g. d., "Lady Wild Eyes 2nd," by "Touchstone" (20,986); gr. g. g. d., "Lady Wild Eyes," by "Weathercock" (9815): and Second Prize, 15*l.*, for "Dowager 2nd," roan, 1 year, 10 months, 4 days-old, in-calf; bred by exhibitor; sire, "Duke of Connaught" (33,604); dam, "Dora," by "Second Duke of Airdrie" (19,600); g. d., "Darling," by "Fourth Duke of Oxford" (11,387); gr. g. d., "Darlington 4th," by "Sir Hugh" (12,082); gr. g. g. d., "Darlington 2nd," by "Percy" (9472).

Jonathan Peel, Knowlmere Manor, Clitheroe, Yorkshire: Third Prize, 10*l.*, for "Casquette," roan, 1 year, 9 months, 4 weeks, 1 day-old; bred by Mr. W. S. Woodroffe, Beaumont Grange, Lancaster; sire, "Knight of Knowlmere 2nd" (31,542); dam, "Cosette 8th," by "Baron Stackhouse" (30,488); g. d., "Cosette 4th," by "The Premier" (27,640); gr. g. d., "Cosette 2nd," by "Columbus 2nd" (17,588); gr. g. g. d., "Cosette," by "Coriolanus" (12,638).

JOHN ELWELL, Timberley, Castle Bromwich, Warwickshire: **FOURTH PRIZE**, 5*l.*, for "Empress Eugenie," roan, 1 year, 1 month, 3 weeks, 2 days-old; bred by exhibitor; sire, "Burghley Telemachus" (39,524); dam, "Empress 2nd," by "Waterloo Prince" (30,279); g. d., "Oxford Duchess," by "Don Windsor 2nd" (21.550); gr. g. d., "Empress," by "Oxford Duke" (15,036); gr. g. g. d., "Emma 4th," by "Emperor" (6973).

CLEMENT STEPHENSON, Newcastle-on-Tyne: the *Reserve Number* and *Highly Commended* for "Alice Smeaton," roan, 1 year, 11 months, 1 week, 5 days-old; bred by Mr. Robert Bruce, Great Smeaton, Northallerton, Yorkshire; sire, "Hyperion" (34,196); dam, "Alice Lee," by "Baron Killerby" (27,949); g. d., "Lady Alice," by "Lord Charles" (31,634); gr. g. d. "Lavinia Alice," by "Duke of Bedford" (23,722); gr. g. g. d., "Alice Lisle," by "Signet Seal" (18,824).

Shorthorn Heifer Calves, above Six and under Twelve Months old.

BENJAMIN ST. JOHN ACKERS, Prinknash Park, Painswick: **FIRST PRIZE**, 20*l.*, for "Lady Georgina Newcomb," roan, 11 months, 2 days-old; bred by exhibitor; sire, "Lord Prinknash 2nd" (38,653); dam, "Lady Georgina Turbitt," by "County Member" (28,268); g. d., "Patience Heatherstone," by "British Crown" (21,322); gr. g. d., "Virtue," by "Valasco" (15,443); gr. g. g. d., "Lady Georgina," by "Knight Errant" (18,154).

The REV. ROBERT BRUCE KENNARD, Marnhull, Blandford, Dorset: **SECOND PRIZE**, 15*l.*, for "Blossom 5th," roan, 11 months-old; bred by exhibitor: sire, "Lord Fitzclarence 24th" (40,163); dam, "Blossom 3rd," by "Grand Duke of Oxford" (28,763); g. d., "Blossom," by "Earl of Darlington" (26,636); gr. g. d., "Belinda," by "Sir Roger" (16,991); gr. g. g. d., "Berrington Lass," by "Sir Walter 2nd" (10,834).

JOSEPH STRATTON, Alton Priors, Marlborough, Wilts,: **THIRD PRIZE**, 10*l.*, for "Ethelberta," roan, 7 months-old; bred by exhibitor; sire, "Proteus" (40,552); dam, "Minerva," by "Eighth Duke of York" (23,808); g. d., "Europa," by "Windsor Castle" (21,118); gr. g. d., "Lilla," by "Hermit" (14,697); gr. g. g. d., "Eurydice 2nd," by "Lord of the Manor (14,836).

PHILIP ASCROFT, Rufford, Ormskirk, Lancashire: **FOURTH PRIZE**, 5*l*, for "Oxford Maria 2nd," roan, 8 months, 1 day-old; bred by exhibitor; sire, "Barrington King" (37,834); dam, "Oxford Maria," by "Duke of Oxford" (31,004); g. d., "Maria 7th," by "Stockburn Lad" (30,024); gr. g. d., Maria 3rd," by "Oxford" (20,449); gr. g. g. d., "Young Maria," by "Valentine" (17,161).

THE DUKE OF RICHMOND AND GORDON, K.G., Gordon Castle, Fochabers, N.B., the *Reserve Number* and *Highly Commended* for "Lady Violet," roan, 11 months, 3 weeks, 5 days-old; bred by exhibitor; sire, "Royal Hope" (32,392); dam, "Lustre 19th," by "Montrose" (34,873); g. d., "Oxford Lustre," by "Fifteenth Duke of Oxford" (23,776); gr. g. d., 'Lustre 5th," by "Prince Arthur" (16,723); gr. g. g. d., "Lustre 3rd," by "Magnum Bonum" (13,277).

Hereford Bulls above Three Years old.

[illegible] TURNER, The Rodd, Kington, Herefordshire: **FIRST PRIZE**, 25*l.*, for 'Grateful," 7 years, 1 week, 1 day-old; bred by exhibitor; sire, "Sir Thomas" (2228); dam, "Lady Lizzie," by "Jupiter" (3191); g. d., "Lady Court Lass," by "David" (1204); gr. g. d., "Lady Court," by "Mameluke" (1307).

WILLIAM TAYLOR, Showle Court, Ledbury, Herefordshire: SECOND PRIZE, 15*l.*, for "Thoughtful" (5063), 5 years, 9 months, 6 days-old; bred by exhibitor; sire, "Mercury" (3967); dam, "Young Beauty," by "Sir Francis" (3438); g. d., "Beauty," by "Holmer" (2043); gr. g. d., "Hazel," by "Tomboy" (1097).

FREDERICK PLATT, Barnby Manor, Newark, Notts, the *Reserve Number* to "Hartington" (5358), 3 years, 11 months, 2 weeks, 5 days-old; bred by Mr. B. Rogers, The Grove, Pembridge, Herefordshire; sire, "The Grove 3rd" (5051); dam, "Gay," by "Longhorn" (3216); g. d., "Gay," by "Matchless" (2110); gr. g. d. "Gay," by "Trusty" (2847).

Hereford Bulls, above Two and not exceeding Three Years old.

JOHN HUNGERFORD ARKWRIGHT, Hampton Court, Leominster, Herefordshire: FIRST PRIZE, 25*l.*, for "Conjuror," 2 years, 10 months, 3 weeks, 5 days-old; bred by exhibitor; sire, "Concord" (4458); dam, "Ivington Lass 3rd," by "Bayleaf" (3675); g. d., "Ivington Lass," by "Dan O'Connell" (1952).

EDWARD LISTER, Cefn Ila, Usk, Monmouthshire: SECOND PRIZE, 15*l.*, for "Taurus," 2 years, 6 months, 2 weeks, 2 days-old; bred by exhibitor; sire, "May Duke (5463);" dam, "Vesta," by "Chanter" (3738); g. d., "Leda," by "Chorister" (3021); gr. g. d., "Young Venus," by "Earl Derby 2nd" (2510).

Hereford Yearling Bulls, above One and not exceeding Two Years old.

SARAH EDWARDS, Wintercott, Leominster, Herefordshire, FIRST PRIZE, 25*l.*, for "President," 1 year, 11 months, 3 weeks, 1 day-old; bred by exhibitor; sire, "Royalist (4921); dam, "Plum 3rd," by "Commander" (4452); g. d., "Plum," by "Comet" (2469); gr. g. d., "Gem," by "Adforton" (1839): and SECOND PRIZE, 15*l.*, for "Landlord," 1 year, 10 months, 3 weeks, 6 days-old; bred by exhibitor; sire, "Royalist" (4921); dam, "Laura," by "Winter de Cote" (4253); g. d., "Lovely 2nd," by "Tomboy" (3465); gr. g. d., "Lady Grove," by "Adforton" (1839).

FREDERICK PLATT, Barnby Manor, Newark, Notts: THIRD PRIZE, 5*l.*, for "Horace 4th," 1 year, 11 months, 2 weeks-old; bred by exhibitor; sire, "Horace" (3877); dam, "Nutty," by "Cholstrey" (1918); g. d. "Nutty," by "Lord Clyde" (2084); gr. g. d., "Nutty," by "Lord Clyde" (2084).

WILLIAM TAYLOR, Showle Court, Ledbury, Herefordshire: the *Reserve Number* to "Trafalgar," 1 year, 9 months, 2 weeks, 6 days-old; bred by exhibitor; sire, "Thoughtful" (5063); dam, "Monkton Beauty 3rd," by "Mercury" (3967); g. d., "Young Beauty," by "Sir Francis" (3438); gr. g. d., "Beauty," by "Holmer (2043).

Hereford Bull Calves, above Six and not exceeding Twelve Months old.

HERBERT RICHARD HALL, Ashton House, Leominster, Herefordshire: FIRST PRIZE, 15*l.*, for "Dale Tredegar," 10 months, 2 weeks, 3 days old; bred by Mr. H. J. Bailey Rosedale, Tenbury; sire, "Tredegar" (5077); dam, "Rosa Lee 2nd," by "King of the Dale" (3891); g. d., "Rosa

Lee," by "Sir Thomas" (2228); gr. g. d., "Rose," by "North Star" (2138).

JOHN HUNGERFORD ARKWRIGHT, Hampton Court, Leominster: **SECOND PRIZE**, 10*l*., for "Broadward," 11 months, 1 week, 3 days-old; bred by exhibitor; sire, "Ivington Boy" (4662); dam, "Annie," by "Dan O'Connell" (1952); g. d., "Amaranth 3rd," by "Philip" (3314); gr. g. d., "Amaranth," by "Luck's All" (1643).

THOMAS JAMES CARWARDINE, Stockton Bury, Leominster: **THIRD PRIZE**, 5*l*., for "Kimbolton," 11 months, 2 weeks, 5 days-old; bred by exhibitor: sire, "Rodney" (4907); dam, "Damsel," by "Longhorns" (4711): g. d., "Ethel," by "De Cote" (3060); gr. g. d., by "Sir John 2nd" (3455): and the *Reserve Number* to "Lord Kilburn," 11 months, 3 weeks, 6 days-old; bred by exhibitor; sire, "Rodney" (4907): dam, "Cherry," by "De Cote" (3060); g. d., "Lilac," by "Heart of Oak" (2035), gr. g. d. by "Counsellor" (1939).

Hereford Cows, in-milk or in-calf, above Three Years old.

THOMAS MYDDLETON, Beckjay, Aston-on-Clun, Salop: **FIRST PRIZE**, 20*l*., for "Nanette," 4 years, 3 months, 2 weeks, 3 days-old; in-milk; calved January 3rd, 1880; bred by exhibitor; sire, "Baron 4th" (4326): dam, "Miss Nobble'em," by "Nobleman" (2652): g. d. by "Jerry" (976); gr. g. d. by "Beefy Ben" (1869).

SARAH EDWARDS, Wintercott, Leominster, Herefordshire: **SECOND PRIZE**, 15*l*., for "Perfection," 5 years, 6 days-old; in-milk; calved September 18th, 1879; bred by exhibitor; sire, "Commander" (4452); dam, "Princess 2nd," by "Leominster 3rd" (3211); g. d., "Princess," by "Tomboy" (3546); gr. g. d., "Pinkey 2nd," by "Adforton" (1839).

WILLIAM TAYLOR, Showle Court, Ledbury, Herefordshire: the *Reserve Number* to "Modesty," 4 years, 10 months, 2 weeks, 3 days-old; calved September 15th, 1879, and in-calf; bred by exhibitor; sire, "Tredegar" (5077); dam, "Lovely," by "Tenant Farmer" (2806); g. d., "Browny," by "Twin" (2284).

Hereford Heifers, in-milk or in-calf, not exceeding Three Years old.

THOMAS FENN, Stonebrook House, Ludlow, Herefordshire: **FIRST PRIZE**, 15*l*., for "Downton Rose," 2 years, 11 months, 5 days-old; in-calf; bred by exhibitor; sire, "Blakemere" (5227); dam, "Rose of the Teme," by "Silver Chief" (495); g. d., "Queen of the Teme," by "Severus 2nd" (2749); gr. g. d., "Victoria," by "Wilson" (4250).

JOHN HUNGERFORD ARKWRIGHT, Hampton Court, Leominster, Herefordshire: **SECOND PRIZE**, 10*l*., for "Gaylass 4th," 2 years, 10 months, 3 weeks, 6 days-old; in-calf; bred by exhibitor; sire, "Ivington Boy" (4662): dam, "Gaylass 2nd," by "Sir Hungerford" (3447); g. d., "Gaylass," by "Riff Raff" (1052); gr. g. d., "Gaily," by "Young Quicksilver."

FREDERICK PLATT, Barnby Manor, Newark, Notts: the *Reserve Number* to "Primrose 4th," 2 years, 11 months-old; in-calf; bred by exhibitor: sire, "Horace (3877);" dam, "Primrose," by "Wolverhampton Boy" (4198); g. d. "Primrose," by "Triumph" (2836); gr. g. d. "Stately," by "Telltale (1757).

Hereford Heifers, above One and not exceeding Three Years old.

FREDERICK PLATT, Barnby Manor, Newark, Notts: **FIRST PRIZE**, 15*l*., fo

"Lady 3rd," 1 year, 9 months, 3 weeks, 4 days-old; bred by exhibitor; sire, "Horace" (3877); dam, "Lady," by "Orleton (3293); g. d., "Lady," by Cholstrey" (1918); gr. g. d., "Lady," by "Lord Clyde" (2084).

JOHN HUNGERFORD ARKWRIGHT, Hampton Court, Leominster: the *Reserve Number* and *Highly Commended* for "Antoinette," 1 year, 11 months, 2 days-old; bred by exhibitor; sire, "Ivington Boy" (4662); dam, "Miss Abigail 2nd," by "Sir Oliver 2nd" (1733); g. d., "Miss Abigail."

Hereford Heifer Calves above Six and under Twelve Months old.

JOHN HUNGERFORD ARKWRIGHT, Hampton Court, Leominster: FIRST PRIZE, 15*l*., for "Pearl 3rd," 11 months, 1 week, 4 days-old; bred by exhibitor; sire, "Ivington Boy" (4662); dam, "Pearl 2nd," by "Sir Hungerford" (3447); g. d., "Pearl," by "Sir Oliver 2nd" (1733); gr. g. d., "Welcome," by "Mortimer" (1328).

THOMAS JAMES CARWARDINE, Stockton Bury, Leominster: SECOND PRIZE, 10*l*., for "Juliet," 11 months, 3 weeks, 3 days-old; bred by exhibitor; sire, "Anxiety," (5188); dam, "Rosaline," by "De Cote" (3060); g. d. by "Heart of Oak" (2035).

THOMAS FENN, Stonebrook House, Ludlow: THIRD PRIZE, 5*l*., for "Countess of the Teme 2nd," 10 months, 3 weeks-old; bred by exhibitor; sire, "Romulus" (5542); dam, "Maid of the Teme," by "Silver Chief," (4952); g. d., "Lady of the Teme," by "Severus 2nd" (2747); gr. g. d., "Victoria," by "Wilson" (4250).

WILLIAM TAYLOR, Showle Court, Ledbury, Herefordshire: the *Reserve Number* to 11 months, 6 days-old; bred by exhibitor; sire, "Horace" (3877); dam, "Monkton Beauty 3rd," by "Sir Francis" (3438); g. d., "Young Beauty," by "Sir Francis" (3438); gr. g. d., "Beauty," by "Holmer" (2043).

Devon Bulls, above Three Years old.

VISCOUNT FALMOUTH, Tregothnan, Probus, Cornwall: FIRST PRIZE, 25*l*., for "Master Molesworth," 3 years, 11 months, 2 weeks, 3 days-old; bred by exhibitor; sire, "Master Flitton" (1160); dam, "Christmas Rose" (3280), by "Sunflower" (937); g. d., "Rosa Bonheur" (3009), by "Corrector" (809); gr. g. d., "Picture 4th" (2224), by Davy's "Napoleon 3rd" (464).

WALTER FARTHING, Stowey Court, Bridgwater: SECOND PRIZE, 15*l*., for "Lord Newsham" (1391), 3 years, 7 months, 3 weeks, 6 days-old; bred by exhibitor; sire, "Master James (1404);" dam, "Famous" (4448), by "Son of Lord Quantock" (874); g. d., "Famous" (1965), by "Duke of Chester" (404); gr. g. d., "Famous" (1319), by "Sultan" (318).

Devon Bulls, above Two and not exceeding Three Years old.

VISCOUNT FALMOUTH, Tregothnan, Probus, Cornwall: FIRST PRIZE, 25*l*., for "Sir Michael," 2 years, 10 months, 2 weeks-old, bred by exhibitor; sire, "Sirloin" (1443); dam, "Water Lily" (5050), by "Jonquil" (1131); g. d., "Watercress" (4006), by "Sunflower" (937); gr. g. d., "Cheesewring" (2572A), by "Protector" (711).

GEORGE TURNER, Great Bowley, Tiverton, Devon: SECOND PRIZE, 15*l*., for "Aqualate," 2 years, 11 months-old; bred by Sir Thomas Boughey, Bart., Aqualate, Newport, Salop.

William Rolles Fryer, Lytchett Minster, Poole, Dorset: the *Reserve Numb* to "Shamrock," 2 years, 4 weeks-old; bred by Mr. R. B. Warren, Chil Oakeford, Blandford; sire, "Lord Salisbury" (1393); dam, "Lovejoy" (3657), by "Viscount Portman" (1239), g. d., "Rusty" (3033), b "Prince of Wales" (910); gr. g. d., "Ruth" (3034), by "Lord Derby" (667).

Devon Yearling Bulls, above Two and not exceeding Three Years old.

William Rolles Fryer, Lytchett Minster, Poole: **First Prize**, 25*l.*, fo "Magnolia," 1 year, 11 months, 1 day-old, bred by exhibitor; sire "Young Palmerston" (1251); dam, "Queen Anne" (4887), by "Duk of Plymouth" (1080); g. d., "Queen" (4886): and **Second Prize**, 15*l.* for "Sweet William," 1 year, 10 months, 1 week-old; bred by Viscoun Portman, Bryanston; sire, "Young Palmerston" (1251); dam, "Famous" (4450), by "Duke of Plymouth" (1080); g. d., "Famous;" gr. g. d. "Fruitful" (3524), by "Exeter" (1098).

Devon Bull Calves, above Six and not exceeding Twelve Months old.

Mrs. Maria Langdon, Flitton Barton, North Molton, Devon: **First Priz** 15*l.*, for "Duke of Flitton 15th," 8 months, 1 week, 2 days-old, bred by exhibitor; sire, "Lord Bath;" dam, "Actress 7th" (3148), by "Duk of Flitton 6th" (1070); g. d. "Actress 3rd" (2749), by "Duke of Flitto 3rd" (826); gr. g. d., "Actress" (1749), by "Palmerston" (476).

Walter Farthing, Stowey Court, Bridgwater, Somerset: **Second Priz** 10*l.*, for "Prettyface's Duke," 10 months, 1 week, 3 days-old; bred by exhibitor; sire, "Master Flitton" (1405); dam, "Prettyface" (3803) by "Lovely Duke" (1152); g. d., "Prettyface" (3804), by "Sir George" (925); gr. g. d., "Young Pink" (2929), by "Viscount" (746).

William Rolles Fryer, Lytchett Minster, Poole, Dorset: the *Reserv Number* and *Highly Commended*, for "Carlisle," 11 months, 3 weeks 3 days-old; bred by Viscount Portman, Bryanston, Blandford; sire "The Count" (1460); dam, "Sugar Candy."

Devon Cows, in-milk or in-calf, above Three Years old.

Mrs. Maria Langdon, Flitton Barton, North Molton: **First Prize**, 20*l.*, fo "Temptress 7th" (5001), 4 years, 1 month, 2 weeks, 2 days-old; in-milk calved April 23rd, 1880; bred by exhibitor; sire, "Duke of Flitton 10th" (1074); dam, "Temptress 5th" (3963), by "Duke of Flitton 5th" (1069); g. d., "Temptress 2nd" (3070), by "Duke of Cornwall (820), gr. g. d., "Gold Medal Temptress" (1672), by "Napoleon 3rd" (464).

[illegible]lter Farthing, Stowey Court, Bridgwater: **Second Prize**, 10*l.*, f "Prettyface 2nd" (4858), 3 years, 9 months, 2 days-old; in-milk; calve ugust 6th, 1879, and in-calf; bred by exhibitor; sire, "Master Willie 1163), dam, "Prettyface" (3803), by "Lovely's Duke" (1162); g. "Prettyface" (3804), by "Sir George" (925); gr. g. d., "Young Pink 929), by "Viscount" (746).

[illegible] Rolles Fryer, Lytchett Minster, Poole: the *Reserve Number* a *Highly Commended* for "Azalea" (4055), 3 years, 1 month-old; in-mil alved April 1st, 1880; bred by Viscount Portman, Bryanston, Blan rd; sire, "The Earl" (1464); dam, "Bluebell" (4114), by "Emper 1098) [illegible] "B[illegible]nd" (4152)

Devon Heifers, in-milk or in-calf, above Two and not exceeding Three Years old.

WALTER FARTHING, Stowey Court, Bridgwater, Somerset: FIRST PRIZE, 15*l.*, for "Famous 2nd," 2 years, 8 months, 3 weeks, 3 days-old; in-calf; bred by exhibitor; sire, "Master Willie" (1163); dam, "Famous" (4448), by "Son of Lord Quntock" (784); g. d., "Famous" (1965), by "Duke of Chester (404); gr. g. d. "Famous" (1391), by "Sultan" (318).

WILLIAM ROLLES FRYER, Lytchett Minster, Poole: SECOND PRIZE, 10*l.*, for "Kalmia," 2 years, 11 months, 3 weeks, 1 day-old; in-milk and in-calf; bred by Viscount Portman, Bryanston, Blandford, Dorset; sire, "The Earl" (1464); dam, "Quail" (4880), by "Emperor" (1096); g. d., "Queen" (4886): and the *Reserve Number* to "Bouquet," 2 years, 10 months, 3 days-old, in-calf; bred by exhibitor; sire, "The Earl" (1464); dam, "Balsam" (4056), by "Emperor" (1096); g. d., "Blanche" (3215), by "Prince Albert" (907); gr. g. d., "Beauty."

Devon Yearling Heifers, above One and not exceeding Two Years Old.

WALTER FARTHING, Stowey Court, Bridgwater: FIRST PRIZE, 15*l.*, for "Famous 3rd," 1 year, 7 months, 4 weeks, 1 day-old; bred by exhibitor; sire, "Royal Aston" (1437); dam, "Famous" (4448), by "Son of Lord Quantock" (874); g. d., "Famous" (1965), by "Duke of Chester" (404); gr. g. d., Famous" (1319), by "Sultan" (318).

WILLIAM ROLLES FRYER, Lytchett Minster: SECOND PRIZE, 10*l.*, for "Fuchsia," 1 year, 4 months, 1 week-old; bred by Viscount Portman, Bryanston, Blandford; sire, "Flower's Duke" (1341); dam, "Young Fancy," by "Triumph 3rd" (1475); g. d., "Fancy:" and the *Reserve Number* to "Hyacinth," 1 year, 7 months, 2 weeks, 1 day-old, bred by exhibitor; sire, "Sultan" (1455); dam, "Balsam" (4056), by "Emperor" (1096); g. d., "Blanche" (3215), by "Prince Albert" (907); gr. g. d., "Beauty."

Devon Heifer Calves, above Six and under Twelve Months old.

WILLIAM ROLLES FRYER, of Lytchett Minster: FIRST PRIZE, 15*l.*, for his "Daphne," 9 months, 3 weeks, 5 days-old; bred by the late Mr. J. A. Smith, Bradford Peverell, Dorchester; sire, "Jonquil" (1365); dam, "Fancy" (4480A), by "Major" (1155); g. d., "Fancy 2nd" (3474), by "Duke of York" (1085); gr. g. d., "Fancy" (2693), by "Earl of Exeter."

WALTER FARTHING, Stowey Court, Bridgwater: SECOND PRIZE, 10*l.*, for his "Lady Currypool 2nd," 10 months, 2 weeks, 4 days-old; bred by exhibitor; sire, "Lord Newsham (1391); dam, "Lady Currypool," by "Profit's Duke" (1194).

ALFRED CHARLES SKINNER, Pound Farm, Bishop's Lydeard, Taunton, Somerset: the *Reserve Number* to his 10 months, 4 days-old; bred by exhibitor; sire, "Duke of Farrington (1323); dam, "Duchess 3rd" (4418), by "Sir Wroth" (1451); g. d., Boucher's "Duchess" (4123).

Sussex Bulls, above Three Years old.

EDWARD and ALFRED STANFORD, Eatons, Ashurst, Steyning, Sussex: FIRST PRIZE, 20*l.*, for "Paris" (357), red, 3 years, 11 months, 4 weeks-old; bred by exhibitors; sire, "Bedford" (316); dam, "Rosedew 1st" (2129), by

" Dorchester (325); g. d., " Rosedew " (2128), by " Young Westminst (159.)

JOHN and ALFRED HEASMAN, Angmering, Worthing, Sussex: SECOND PRI 10*l*., for " Hereford " (263), red, 4 years, 9 months, 1 day-old; bred exhibitors; sire, " Leopold " (228); dam, " Sandgate " (1661).

Sussex Bulls, above Two and not exceeding Three Years old.

JAMES STEWART HODGSON, Lythe Hill, Haslemere, Surrey: FIRST PRIZE, 2 for " Oxford " (304), red, 2 years, 9 months, 2 weeks, 4 days-old; b by Mr. A. Agate, Broomhall, Horsham; sire, " Berry " (259); da " Honesty 2nd " (1618), by " Alfred 2nd " (177); g. d., " Hones (1333), by " Grand Duke " (183); gr. g. d., " Honesty " (443), " Unicorn " (15).

EDWARD and ALFRED STANFORD, Eatons, Ashurst, Steyning: SECOND PRI 10*l*., for " Southampton," red, 2 years, 10 months, 2 weeks, 4 days bred by exhibitors; sire, " Bedford " (316); dam, " Rosedew 1st (2129), by " Dorchester " (325); g. d. " Rosedew " (2128), by " You Westminster " (159).

ALFRED AGATE, Broomhall, Horsham, Sussex: the *Reserve Number* " Berry 1st " (292), red, 2 years, 9 months-old; bred by exhibitor; si " Berry " (259); dam, " Actress 4th " (1676), by " Grand Duke " (18

Sussex Yearling Bulls, above One and not exceeding Two Years old.

JOHN and ALFRED HEASMAN, Angmering, Worthing: FIRST PRIZE, 15*l*. " Royal Kilburn," red, 1 year, 10 months, 3 weeks, 2 days-old; bred exhibitors; sire, " Hereford " (263); dam, " Cherry " (1244), by " W liam " (139); g. d., " Leicester " (1120).

ALFRED AGATE, Broomhall, Horsham: SECOND PRIZE, 10*l*., for " Frankenste 2nd " (328), red, 1 year, 11 months-old; bred by exhibitor; si " Berry " (259); dam, " Young Gentle " (1737), by " Frankenstei (181).

BLAKE DUKE, Lyminster, Arundel, Sussex: the *Reserve Number* to " P tector," red, 1 year, 6 months, 1 week, 5 days-old; bred by exhibit sire, " His Grace;" dam, " Beauty," by " Bacchus;" g. d., " Damsel Younger," by " Young Barton."

Sussex Cows, in-milk or in-calf, above Three Years old.

EDWARD and ALFRED STANFORD, Eatons, Ashurst, Steyning: FI PRIZE, 20*l*., for " Hardy," (2039), red, 10 years, 2 weeks, 4 days in-milk, calved November 10th, 1879; bred by exhibitors; sire, " You Westminster " (159); dam, " Mayflower " (1190).

JAMES STEWART HODGSON, Lythe Hill, Haslemere, Surrey; SECOND PRI 10*l*., for " Young Daisy " (2173); red, 5 years-old; calved Sept. 2 1879 and in-calf; bred by Mr. John Turvill, Hartley Park Farm, Alt Hants; sire, " Tom; dam, " Daisy."

Sussex Heifers, in-milk or in-calf, above Two and not exceeding Th Years old.

[illegible] and ALFRED HEASMAN, Angmering, Worthing: FIRST PRIZE, 15*l*., " Peace," red, 2 years, 9 months, 2 weeks, 6 days-old; in-calf; bred exhibitors; sire, "Croydon" (245); dam, "Snowdrop" (1727), by "Egerton;" g. d., "Leicester" (1120), by "Prince Arthur" (129); gr. g. d., "Plymouth" (1024), by "The Duke" (97).

BLAKE DUKE, Lyminster, Arundel: SECOND PRIZE, 10*l.*, for "Lofty the Younger," red, 2 years, 3 months, 4 days-old, in-calf; bred by exhibitor; sire, "Hereford;" dam, "Young Lofty," by "Challenger the Younger;" g. d., "Lofty by Selmeston."

ALFRED AGATE, Broomhall, Horsham: the *Reserve Number* and *Highly Commended* for "Lucy 3rd," red, 2 years, 2 weeks-old; in-calf; bred by exhibitor; sire, "Berry" (259); dam, "Lucy 2nd" by "Alfred 2nd" (177).

Sussex Yearling Heifers, above One and not exceeding Two Years old.

JOHN and ALFRED HEASMAN, Angmering, Worthing: FIRST PRIZE, 15*l.*, for their red, 1 year 11 months; bred by exhibitors; sire, "Hereford" (263); dam, "Snowdrop" (1727); g. d., "Leicester" (1120), by "Prince Arthur" (129).

BLAKE DUKE, Lyminster, Arundel: SECOND PRIZE, 10*l.*, for his "Royal Princess," red, 1 year, 10 months, 1 day-old; bred by exhibitor; sire, "Hereford;" dam, "Duchess," by "Sir Roger;" g. d., "Lofty," by "Selmeston."

ALFRED AGATE, Broomhall, Horsham: the *Reserve Number* and *Highly Commended* for his "Actress 5th" (1397), red, 1 year, 10 months, 1 week, 4 days-old; bred by exhibitor; sire, "Berry" (259); dam, "Actress 4th" (1676), by "Grand Duke" (183).

Longhorn Bulls, Two Years old and Upwards.

MAJOR-GEN. SIR F. W. FITZWYGRAM, Bart., Leigh Park, Havant, Hants: FIRST PRIZE, 20*l.*, for "Prince Victor" (164), brindle and white, 6 years, 3 months-old; bred by Mr. Shaw, Fradley Old Hall, Lichfield; sire, "Earl of Upton 7th" (76); dam, "Princess," by "Burberry's Pride" (21).

RICHARD HALL, Thurlston Grove, Derby: SECOND PRIZE, 10*l.*, for "Earl of Fradley 1st" (62), brindle and white, 5 years, 4 months, 1 week, 2 days-old; bred by Mr. Shaw, Fradley Old Hall, Lichfield; sire, "Earl of Upton 7th" (76); dam, "Fidget," by "Sir Oliver" (200); g. d., "Lily 2nd," by "Hagley Hero" (163); gr. g. d., "Lily 1st," by "Burbery's Pride" (21).

THE DUKE OF BUCKINGHAM AND CHANDOS, Stowe, Buckingham: the *Reserve Number* and *Highly Commended* for "Earl of Temple," brindle and white, 5 years, 10 months, 2 weeks, 4 days-old; bred by exhibitor; sire, "Conqueror 3rd;" dam, "Duchess," by "Boycott;" g. d., "Diadem," by "Tamworth;" gr. g. d., "Dolly."

Longhorn Bulls, under Two Years old.

SIR JOHN HARPUR CREWE, Bart., Calke Abbey, Derby: FIRST PRIZE, 15*l.*, for "Harlequin," brindle and white, 1 year, 6 months, 1 week, 1 day-old; bred by exhibitor; sire, "Abbot of Calke;" dam, "Gaudy," by "Tippoo;" g. d., "Sparkenhoe Lass," by "Emperor;" gr. g. d., "Old Spondon," by "Curzon."

RICHARD HALL, Thurlston Grove, Derby: SECOND PRIZE, 10*l.*, for "The Monk," brindle and white, 1 year, 6 months, 4 days-old; bred by Mr.

Richard Hall, Thulston Grove, Derby: First Prize, 2
dan 2nd," brindle and white, 4 years, 2 months, 1
in-milk; calved February 29th, 1880; bred by exhibi
Upton 3rd" (72); dam, "Maid of Bodelwyddan,"
(133); g. d., "Lady Whitacre," by Warner's "Bull
"Lily," by Weston's "Bull" (263): and Second Pri
face 2nd," red and white, 5 years, 2 months, 2 weeks, 5
calved June 2nd, 1880; bred by Mr. Shaw, Fradley
sire, "Earl of Upton 7th" (76); dam, "Tidy," by "
g. d., "Lily 2nd" by "Hagley Hero" (103); gr. g.
"Burbery's Pride" (21).

Richard Hemming Chapman, Calke, Derby: Third Pr
Upton 77th," red and white, 7 years, 1 week, 6
April 2nd, 1870, and in-calf; bred by exhibitor; si
dam, "Fillpail," by "Sampson;" g. d., "Old Fillpa
gr. g. d., "Cherry," by "Young Roll-right."

Longhorn Heifers, under Three Years o

The Duke of Buckingham and Chandos, Stowe, Bu
Prize, 15*l.*, for "Lady Aston," red and white, 2
2 weeks, 1 day-old; in-calf; bred by exhibitor; sire, "
dam, "Lady Arden 2nd," by Twycross's "Bull" (240)
by "Old Messenger;" gr. g. d., "Weston Lady."

Major-Gen. Sir F. Fitzwygram, Bart., Leigh Park,
Prize, 10*l.*, for "First Link," red and white, 2 years,
6 days-old; in-calf; bred by exhibitor; sire, "Pri
dam, "Upton's Last Link Save One," by "Shakesp
"Lady Cake," by "Earl of Warwick" (77); gr. g.
Beauty," by "Sparkenhoe" (206): and Third Priz
nate," red and white, 2 years, 3 months, 1 w
in-calf, bred by exhibitor; sire, "Prince Victor" (1

old; bred by Mr. John Le Brocq, St. Clements, Jersey; sire, "Napier;" dam, "Lily."

Francis Le Brocq, Augerez, St. Peter's, Jersey: Second Prize, 10*l.*, for "Farmer's Glory" (276), grey, 2 years, 4 months-old; bred by Mr. F. Becquet, Chestnut Farm, St. Peter's, Jersey; sire, "Grey King" (169); dam, "Bonheur" (1651).

John Le Brun, St. Ouen's, Jersey: Third Prize, 5*l.*, for "Loyal Saturday" (215), fawn, 2 years, 3 months-old; bred by Mr. Philip Vantier, Val de la Mare, St. Ouen's, Jersey; sire, "Browny" (158); dam, "Orange" (1079).

George Simpson, Wray Park, Reigate, Surrey: the *Reserve Number* and *Highly Commended* for "Milkboy," silver-grey, 2 years, 5 days-old; bred by exhibitor; sire, "Pride;" dam, "Milky," by "Ducal;" g. d., "Milkgirl," by "Banboy; gr. g. d., "Milkmaid" by "Jack Weller."

Jersey Bulls under Two Years old.

William Henry Wakefield, Sedgwick, Kendal, Westmoreland: First Prize, 15*l.*, for "Aldston 3rd," silver-grey, 1 year, 7 months, 2 weeks, 6 days-old; bred by exhibitor; sire, "Gladstone 2nd;" dam, "Grisette," by "Yankee;" g. d., "Queen of the Valley."

John Le Brun, St. Ouen's, Jersey: Second Prize, 10*l.*, for "Sir Harry" (314), light grey, 1 year, 7 months, 1 week, 2 days-old; bred by Mr. Philip Le Feuvre, St. Ouen's, Jersey; sire, "Grey King;" dam, "Nilly."

George Simpson, Wray Park, Reigate: Third Prize, 5*l.*, for "Nimrod," grey, 10 months 1 day-old; bred by exhibitor; sire, "Prince Albert Victor;" dam, "Nanette," by "Gipsy King;" g. d., "Nannie."

Robert Loder, Whittlebury, Towcester, Northamptonshire: the *Reserve Number* and *Highly Commended* for "Pride of Stoke," whole colour, 1 year 11 months, 1 week, 4 days-old; bred by Mr. J. E. Coleman, Stoke Park, Slough; sire, Mr. Simpson's "The Pride;" dam, "Pretty Maid.

Jersey Cows, in-calf or in-milk, Three Years old and upwards.

George Simpson, Wray Park: First Prize, 20*l.*, for "Her Majesty," fawn, 8 years, 2 months-old; in-milk; calved April 28th, 1880; bred by Mr. E. Hubert, St. Ouens, Jersey; sire, "Jack;" dam, "Camille:" and Second Prize, 10*l.*, for "Milky," silver-grey, 5 years, 10 months, 3 weeks, 1 day-old; in-milk; calved June 9th, 1879, and in-calf (due to calve before the Show); bred by Mr. Walter Gilby, Hargrave Park, Stanstead, Essex; sire, "Ducal;" dam, "Milkgirl," by "Banboy;" g. d., "Milkmaid," by "Jack Weller;" gr. g. d., "Grasshopper," by "Omar Pasha."

William Farnell Watson, Redlees, Isleworth, Middlesex: Third Prize, 5*l.*, for "Rose," silver-grey, 6 years, 3 months, 3 weeks-old; in-milk; calved July 20th; bred by exhibitor.

James Ashcroft, Grange House, Oakhill Park, Old Swan, Liverpool: the *Reserve Number* and *Highly Commended* for "Souris," silver-grey, 3 years, 2 months, 4 days-old; calved June 1, 1879; in-calf (due to calve before the Show); bred by Mr. A. L'Heron, St. Helier's, Jersey; sire, "Apollo" (108); dam, "Brunette" (142).

Jersey Heifers under Three Years old.

Francis Le Brocq, Augerez, St. Peter's, Jersey: First Prize, 15*l.*, for

"Longueville Belle," grey, 2 years, 4 m
by Mr. P. Laurens, Longueville, St. Sa
Lion" (140); dam, "Josephine."

GEORGE SIMPSON, Wray Park: SECOND PRIZ
silver grey, 2 years, 1 month, 3 week
before the Show); bred by Mr. J. Le
"Grey King;" dam, "Temptation," by
not."

FRANCIS LE BROCQ, Augerez: THIRD PRIZE,
4 months-old; in-milk; bred by Mr. J.
sire, "Virtumnus" (161); dam, "Butte

GEORGE SIMPSON, Wray Park: the *Reserve*
for "Sans-Souci," grey fawn, 2 years, 2
in-calf (to calve before the Show); br
Poy; dam, "Sanspareil," by "Sir Wil
by "Hero 2nd;" gr. g. d., "Jeannette."

Guernsey Bulls, above O

JAMES JAMES, Les Vauxbelets, Guernsey:
of Les Vauxbelets," red and white, 2 year
bred by exhibitor; sire, "Royal Duk
"Forester;" g. d., "Rosy."

ROBERT N. G. BAKER, Heavitree, Devon: S
red and white, 2 years, 10 months, 2
de Garis, St. Peter's, Guernsey; sire,
"Prince."

Guernsey Cows, in-calf or in-milk,

ROBERT N. G. BAKER, Heavitree, Exeter:
2nd," yellow and white, 5 years, 9 mont
before the Show); bred by exhibitor;
1st," by "Champion."

JAMES JAMES, Les Vauxbelets, Guernsey:
bud," red and white, 6 years, 4 months
1879, and in-calf (to calve before the
"Lord of the Isles;" dam, "Bo-Peep;"

ROBERT N. G. BAKER, Heavitree: the *Res*
mended for "Dolly," red and white,
calved March 25, 1880; bred by exh
"Nelly."

Guernsey Heifers not exceedin

JAMES JAMES, Les Vauxbelets: FIRST PRIZE
2 years, 11 months, 1 week, 2 days-ol
La Marcherie, Guernsey; sire, "Billy;"

ERT N. G. BAKER, Heavitree: SECON
d and white, 1 year, 8 months, 3 we
Prince Charlie;" dam, "Primrose:"
rd," red and white, 2 years, 1 month, 6 d
Prince Charlie 1st;" dam, "Nancy 2nd
[illegible] *Highly Commended* for "N

11 months, 5 days-old; in-milk; bred by Mr. C. Le Page, St. Andrew's, Guernsey; dam, "Prettymaid."

Norfolk and Suffolk Polled Bulls, Two Years old and upwards.

THOMAS LEONARD PALMER, Wilby, Attleboro', Norfolk: FIRST PRIZE, 15*l.*, for "Davyson 3rd," red, 6 years, 11 months-old; bred by Mr. J. Hammond, Bale, East Dereham; sire, "The Baron" (9); dam, "Davy 7th," by "Young Duke" (234).

ALFRED TAYLOR, Starston Place, Harleston, Norfolk: SECOND PRIZE, 10*l.*, for "King Charles" (329), red, 4 years, 1 week, 3 days-old; bred by the late Mr. J. Foster Palmer, Wilby, Attleboro', Norfolk; sire, "Davyson 3rd" (48); dam, "Young Spot," by "Wilby Chapman" (228); g. d., "Spot" (558), by "Wonder" (231); gr. g. d., "Rose," by "Elmham Bull."

ROBERT EMLYN LOFFT, Troston Hall, Bury St. Edmund's, Suffolk: THIRD PRIZE, 5*l.*, for "Stout," red, 2 years, 11 months, 2 weeks-old; bred by exhibitor; sire, "Donald" (291); dam, "Handsome 5th."

JOHN HAMMOND, Bale, East Dereham, Norfolk: the *Reserve Number* and *Highly Commended* for "Davyson 6th," red, 3 years, 2 months-old; bred by exhibitor; sire, "Davyson 4th;" dam, "Davy 19th."

Norfolk and Suffolk Polled Bulls, not exceeding Two Years old.

JOHN HAMMOND, Bale, Dereham, Norfolk: FIRST PRIZE, 15*l.*, for "Davyson 7th," red, 1 year, 7 months-old; bred by exhibitor; sire, "Davyson 5th;" dam, "Davy 17th," by "Tenant Farmer."

JEREMIAH JAMES COLMAN, M.P., Carrow House, Norwich: SECOND PRIZE, 10*l.*, for "Ben," red, 1 year, 9 months, 1 week, 3 days-old; bred by Mr. B. Brown, Wellingham, Fakenham; sire, "Robin Hood;" dam, "Rose 5th," by "Norfolk Duke;" g. d., "Rose 2nd," by "Tenant Farmer."

ALFRED TAYLOR, Starston Place, Harleston, Norfolk: the *Reserve Number* to "Starston Prince," red, 11 months, 2 weeks, 2 days-old; bred by exhibitor; sire, "King Charles" (329); dam, "Nettle" (1049), by "Easton Duke" (61); g. d., "Nancy R. 2," by "Richard 2nd" (173); gr. g. d., "Lovely 2nd," by "Richard 2nd" (173).

Norfolk and Suffolk Polled Cows, in-calf or in-milk, Three Years old and upwards.

JEREMIAH JAMES COLMAN, M.P., Carrow House, Norwich: FIRST PRIZE, 15*l.*, for "Fanny," red, 8 years, 10 months, 2 weeks-old; in-milk; calved December 22nd, 1879; bred by the late Lord Sondes, Elmham Hall, East Dereham; sire, "Hero 3rd;" dam, "Madam Freeman."

ALFRED TAYLOR, Starston Place, Harleston: SECOND PRIZE, 10*l.*, for "Flirt," (894), red, 3 years, 11 months, 5 days-old; in-milk; calved November 8th, 1879, and in-calf; bred by exhibitor; sire, "Easton Duke" (61); dam, "Sly," by "Sir Edward 1st" (197); g. d., "Strawberry 2nd," by "Richard 2nd" (173); gr. g. d., "Tiny," by "Laxfield Sire" (101).

ROBERT EMLYN LOFFT, of Troston Hall, Bury St. Edmund's, Suffolk: THIRD PRIZE, 5*l.*, for "Poppet 2nd," red, 5 years, 8 months, 4 days-old; calved June 6th, 1879, and in-calf; bred by exhibitor; sire, "Cherry Duke" (32); dam, "Poppet 1st U 43."

The Duke of Hamilton and Brandon, K.T., Easton Park, Wickh Market, Suffolk: the *Reserve Number* and *Highly Commended* "Ruby," red, 6 years, 2 months, 2 days-old; in-milk, calved Septem 1879, and in-calf; bred by Sir E. C. Kerrison, Bart., Oakley Park, Sc Suffolk; sire, "Marquis 3rd;" dam, "Queen 2nd," by "Major" (10 g. d., "Queen."

Norfolk and Suffolk Polled Heifers, under Three Years old.

Jeremiah James Colman, M.P., Carrow House: **First Prize, 15*l*.,** "Silence," red, 2 years, 6 months, 2 days-old; in-calf; bred by exhibi tor; sire, "Disraeli;" dam, "Silent Lass," by "Powell;" g. d., "Silenc by "Rifleman;" gr. g. d., "Silence."

John Hammond, Bale, Dereham, Norfolk: **Second Prize, 10*l*.,** for "Da 24th," red, 2 years, 3 months-old; in-calf; bred by exhibitor; si "Davyson 5th;" dam, "Davy 15th," by "Tenant Farmer."

Jeremiah James Colman, M.P., Carrow House: **Third Prize, 5*l*.,** f "Cherryleaf," red, 1 year, 8 months, 2 weeks-old; bred by exhibitor sire, "Beau;" dam, "Cherry 5th," by "Norfolk Duke;" g. d., "Cherr 2nd."

Thomas Leonard Palmer, Wilby, Attleboro', Norfolk: the *Reser Number* and *Highly Commended* to "Buxom," red, 1 year, 11 month 3 days-old; bred by the late Mr. J. F. Palmer, Wilby; sire, "Davys 3rd" (48); dam, "Cheerful," by "Young Major" (235); g. d., "Spot by "Wonder" (231); gr. g. d., "Rose K. 19."

Ayrshire Bulls, above Two Years old.

The Duke of Buccleuch and Queensberry, K.G., Drumlanrig, Thornhil Dumfries: **First Prize, 20*l*.,** for "Morning Star" (43), white and dar brown, 4 years, 1 month, 1 week, 3 days-old; bred by Mr. Willia Hunter, Craighead, Abington, Lanark; sire, "Chieftain;" dam, "Quee Mary," by "The Duke;" g. d., "Duneaton Beauty," by "Invincible:" and **Second Prize, 10*l*.,** for "Lord of the Isles," white and dark brown 3 years, 2 months-old; bred by Mr. Wm. Boyd, Bongany, Girva Ayrshire.

Ayrshire Cows, in-calf, or in-milk, above Three Years old.

The Duke of Buccleuch and Queensberry, K.G.: **First Prize, 15*l*.,** f "Juno 5th of Drumlanrig," brown and white, 3 years, 4 months, 1 wee 3 days-old; in-calf (due to calve before the Show); bred by exhibito sire, "Righead of Drumlanrig" (51); dam, "Juno of Drumlanrig" (22 **Second Prize, 10*l*.,** for "Lady Jane," red and white, 4 years, 2 month old; calved May 12, 1879, and in-calf (due to calve before the Show bred by Messrs. R. and S. Howie, Drumter, Fenwick, Ayrshire; si "Drumter" (15); dam, "Betsey:" and **Third Prize, 5*l*.,** for "Blackston white and brown, 3 years, 3 months-old; in-calf (due to calve bef the Show); bred by Mr. Andrew Allan, Munnoch, Dalry, N.B.; s Winton;" dam, "Blackstone," by "Shankston."

[illegible] Duncan, Benmore Kilmun, Greenock, Argyleshire: the *Rese Number* and *Highly Commended* for his brown and white, 6 ye months-old; in-calf (due to calve before the Show); bred by [illegible] Young, Carnwath, Lanark; sire, "Lord Lorne."

Ayrshire Heifers not exceeding Three Years old.

The Duke of Buccleuch and Queensberry, K.G.: First Prize, 15*l.*, for "Eva of Drumlanrig," white and brown, 2 years, 3 months, 1 week, 5 days-old; in-calf; bred by Mr. John Gilmour, Kells, Southwick, Kirkcudbright; sire, "Prince Charlie;" dam, "Snowdrop:" Second Prize, 10*l.*, for "Pearl," white and red, 2 years, 8 months, 1 week, 3 days-old; in-calf; bred by Mr. Andrew Allen, Munnoch, Dalry, N.B.; sire, "Winton" (64); dam, "Davies:" Third Prize, 5*l.*, for "Belle of Drumlanrig," red and white, 2 years, 4 months, 2 days-old; in-calf; bred by exhibitor; sire, "Orchardton;" dam, "Stately:" and the *Reserve Number* and *Highly Commended* for "Beauty of Drumlanrig," white and red, 2 years, 4 months, 5 days-old; in-calf; bred by exhibitor; sire, "Burntwoodhill of Drumlanrig" (6); dam, "Barclay 4th of Drumlanrig" (51).

*Polled Galloway Bulls, above Two Years old.**

Peter Morton and Sons, Pedder Hill, Longtown, Cumberland: First Prize, 20*l.*, for "Prince Charlie of Pedder Hill," black, 3 years, 7 months, 2 weeks, 2 days-old; bred by exhibitors; sire, "Mosstrooper of Pedder Hill;" dam, "Agnes of Pedder Hill."

James Little, Fauld, Longtown, Cumberland: Second Prize, 10*l.*, for "Liddesdale" (1031), black, 4 years, 5 months, 5 days-old; bred by Mr. James Graham, Parcelstown, Longtown; sire, "Sim of Whitram" (562); dam, "Semiramis 4th" (1422), by "Willie of Westburnflat" (523); g. d., "Rose of Galloway" (1311), by "Sir James of Balig" (537); gr. g. d. "Semiramis," (703) by "Guardsman" (23).

Sir Frederick U. Graham, Bart., of Netherby, Longtown, Cumberland: Third Prize, 5*l.*, for "Harden" (1151), black, 3 years, 4 months, 3 weeks, 2 days-old; bred by Mr. James Graham, Parcelstown, Longtown; sire, "Sim of Whitram" (562); dam, "Mary of Parcelstown" (1420), by "Willie of Westburnflat" (523); g. d. "Queen of Cullock" (1315), by "Sir Walter" (536); gr. g. d., "Agnes of Meikle Cullock" (220), by "Wellington" (22).

James Cunningham, Tarbreoch, Dalbeattie, Kirkcudbright: the *Reserve Number* to "Knowsley" (1350), black, 3 years, 4 months, 1 week, 1 day-old; bred by exhibitor; sire, "Chieftain of Drumlanrig" (752); dam, "Lady Stanley 2nd" (2858), by "Pretender" (617); g. d., "Lady Stanley" (1670), by "Hossack" (1319); gr. g. d., "Jane of Breckonhill" (3354), by "Emancipation" (1318).

*Polled Galloway Bulls, above One and not exceeding Three Years old.**

Robert Jardine, M.P., Castlemilk, Lockerbie, Dumfriesshire: First Prize, 20*l.*, for "Beaconsfield," black, 2 years, 5 months, 4 weeks-old; bred by the Duke of Buccleuch, Thornhill, N.B.

The Duke of Buccleuch and Queensberry, K.G., Drumlanrig, Thornhill, Dumfries: Second Prize, 10*l.*, for "Stanley of Drumlanrig" (1348), black, 2 years, 5 months-old; bred by exhibitor; sire, "Chieftain of Drumlanrig" (752); dam, "Lady Stanley of Drumlanrig" (2858), by "Pretender" (617); g. d., "Lady Stanley" (1670) by "Hossack" (1319); gr. g. d., "Jane of Breckonhill" (3354), by "Emancipation" (1318).

John Millican, Wedholme House, Abbey Town, Carlisle: Third Prize, 5*l.*, for "The Mackintosh 2nd" (1341), black, 2 years, 3 months, 4 weeks, 2 days-old; bred by Mr. James Graham, Parcelstown, Longtown, Cum-

berland; sire, "Sim of Whitram" (562); **dam, "Hannah 5th" (1**
by "Willie of Westburnflat" (523); **g. d., "Hannah 3rd" (131**
"Bob Burns" (235); gr. g. d., "Hannah" (213), by "Brother to
trooper" (67).

Thomas Graham, Beanlands Park, Irthington, Carlisle: the *Reserve N*
to "Chief of Errington 3rd" (1338), black, 2 years, 5 months, 1
3 days-old; bred by Mr. James Graham, Parcelstown, Long
Carlisle; sire, "Sim of Whitram" (562); dam, "Semiramis 6th" (1
by "Willie of Westburnflat" (523); g. d. "Semiramis 2nd" (132
"Glenorcky" (521); gr. g. d., "Rose of Galloway" (1311), by
James of Balig" (537).

*Polled Galloway Yearling Bulls, above One and not exceeding T Years old.**

James Cunningham, Tarbreoch, Dalbeattie, Kirkcudbright: **First P**
15*l*., for "Prince Victor" (1473), black, 1 year, 2 months, 2 week
bred by exhibitor; sire, "Larriston" (1030); dam, "Mary Dougl
Lawshall" (3276), by "Bob of Denton Hall" (823).

The Duke of Buccleuch and Queensberry, K.G., of Drumlanrig: **Se**
Prize, 10*l*., for "Harden 2nd" (1458), black, 1 year, 4 months, 3 w
1 day-old; bred by Mr. James Graham, Parcelstown, Longtown,
berland; sire, "Sim of Whitram" (562); dam, "Mary of Parcelst
(1420), by "Willie of Westburnflat" (523); g. d., "Queen of Cull
(1315), by "Sir Walter" (536): gr. g. d., "Agnes of Meikle Cull
(220), by "Wellington" (22): **Third Prize**, 5*l*., for "Macl
(1465), black, 1 year, 2 months, 2 weeks, 3 days-old; bred by
bitor; sire, "Black Prince of Drumlanrig" (546); dam, "Ilyth
Drumlanrig" (1307), by "Border Knight" (539); g. d., "Miss Mc
(1302), by "Freebooter" (203); gr. g. d., "McGill" (240), by "
salloch" (92).

James Shennan, Balig, Kirkcudbright: the *Reserve Number* to his "
mandy" (1533), black, 1 year, 4 months-old; bred by exhibitor;
"Duke of Drumlanrig" (667); dam, "Jenny Norman 3rd" (2650
"Norman" (529); g. d., "Jenny Goat" (1347), by "The Goat" (5
gr. g. d., "Jenny Burns" (1334), by "Bob Burns" (235).

Polled Galloway Cows, in-milk or in-calf, above Three Years old.

The Duke of Buccleuch and Queensberry, K.G.: **First Prize**, 20*l*.
"Princess of Culmain" (2995), black, 4 years, 4 months, 3 weeks, 4
old; in-milk; calved January 15th, 1880; bred by Mr. Maxwell C
Culmain, Crocketford, Kirkcudbright; sire, "Black Prince of Drum
rig" (546); dam, "Blossom of Culmain" (2775), by "Manger
(525): **Second Prize**, 10*l*., for "Hannah 3rd of Drumlanrig" (2
black, 5 years, 6 months-old; in-milk; calved January 4th, 1880;
by exhibitor; sire, "Black Prince of Drumlanrig" (546); dam, "
of Drumlanrig" (1382), by "Havelock" (544); g. d., "Hann
Tarbreoch" (2617), by "Sir John the Graham" (522); gr. g. d., "
of Culloch" (1315), by "Sir Walter" (536): **Third Prize**, 5
"Fanny 2nd of Drumlanrig" (2623), black, 5 years, 5 months, 3 w
3 days-old; in-milk; calved January 1st, 1880; bred by exhibitor;
"Black Prince of Drumlanrig" (546); dam, "Fanny of Drumla
1634), by "Freebooter" (203): and the *Reserve Number* for "
Stanley of Drumlanrig" (2858), black, 6 years, 1 month, 2 we
days-old; in-milk; calved January 2nd, 1880; bred by Mr.

Cunningham, Tarbreoch, Dalbeattie; sire, "Pretender" (617); dam, "Lady Stanley" (1670), by "Hossack" (1319); g. d., "Jane of Breckonhill" (3354), by "Emancipation" (1318); gr. g. d., "Rosy of Breckonhill" (3353), by "Black Jock of Pedderhill" (1316).

*Polled Galloway Heifers, in-milk or in-calf, above Two and not exceeding Three Years old.**

JAMES SHENNAN, Balig, Kirkcudbright: FIRST PRIZE, 15*l.*, for "Jenny Duke," black, 2 years, 5 months, 2 weeks, 1 day-old; in-calf; bred by exhibitor; sire, "Duke of Drumlanrig" (667); dam, "Jenny Norman 3rd" (2650), by "Norman" (529); g. d., "Jenny Goat" (1347), by "The Goat" (527); gr. g. d., "Jenny Burns" (1334), by "Bob Burns" (235).

THE DUKE OF BUCCLEUCH AND QUEENSBERRY, K.G.: SECOND PRIZE, 10*l.*, for "Bessie 2nd of Drumlanrig" (3411), black, 2 years, 4 months, 2 weeks-old; in-calf; bred by exhibitor; sire, "Black Prince of Drumlanrig" (546); dam, "Bessie of Drumlanrig" (2183), by "Statesman" (630); g. d., "Countess of Blaiket" (1582), by "Clansman of Blaiket" (629); gr. g. d., "Maggie of Blaiket" (1579), by "Sir Walter" (536): and THIRD PRIZE, 5*l.*, for "Helena of Drumlanrig" (3412), black, 2 years, 5 months, 3 weeks, 4 days-old; in-calf; bred by exhibitor; sire, "Black Prince of Drumlanrig" (546); dam, "Harriet 6th of Drumlanrig" (2646), by "Marquis Elrig" (842); g. d., "Harriet 2nd of Drumlanrig" (2178), by "Son of Sir John the Graham" (1115); gr. g. d., "Harriet of Drumlanrig" (1636), by "Heir-at-Law" (815).

CHRISTOPHER GRAHAM, Breckonhill, Longtown, Cumberland: the *Reserve Number* to "Lizzie of Breckonhill," black, 2 years, 8 months, 2 weeks-old; in-calf; bred by Exhibitor; sire, "Captain;" dam, "Daisy," by "Emancipation;" g. d., "Rosy," by "Black Jock."

*Polled Galloway Yearling Heifers, above One and not exeeeding Two Years old.**

JAMES CUNNINGHAM, Tarbreoch, Dalbeattie, Kirkcudbright: FIRST PRIZE, 15*l.*, for "Lady Stanley 6th," black, 1 year, 5 months, 1 week, 3 days-old; bred by exhibitor; sire, "Queensberry" (1027); dam, "Lady Stanley 3rd" (2861), by "Pretender;" g. d., "Lady Stanley" (1670), by "Hossack" (1319); gr. g. d., "Jane of Breckonhill" (3354), by "Emancipation" (1318): and SECOND PRIZE, 10*l.*, for "Mary 6th of Tarbreoch," black, 1 year, 5 months, 1 week, 2 days-old; bred by exhibitor; sire, "The Mackintosh;" dam, "Bridesmaid of Tarbreoch" (1674), by "Observer" (728); g. d., "Mary 2nd of Tarbreoch," by "Balig" (729).

THE DUKE OF BUCCLEUCH AND QUEENSBERRY, K.G.: THIRD PRIZE, 5*l.*, for "Nightingale 2nd of Drumlanrig" (3653), black, 1 year, 5 months, 4 weeks-old; bred by exhibitor; sire, "Sir William of Drumlanrig" (1039); dam, "Nightingale of Drumlanrig" (1656), by "Prince Bismark" (699); g. d., "Maid Marion 4th" (1668), by "Sir John the Graham" (522); gr. g. d., "Maid Marion 2nd" (2907), by "Glenorcky" (521).

JAMES SHENNAN, Balig, Kirkcudbright: the *Reserve Number* to "Lucy of Balig 8th;" black, 1 year, 5 months, 4 days-old; bred by exhibitor; sire, "Duke of Drumlanrig" (667); dam, "Lucy of Balig 3rd" (1396),

by "Norman" (529); g. d., "Lucy of Balig" **(1340), by "Bob I**
(235); gr. g. d., "Flora McDonald" **(300), by "Geordie of Rig**
(234).

Polled Angus or Aberdeen Bulls, Two Years old and upward

ROBERT ANDERSON, Daugh, Tarland, Aberdeenshire: **FIRST PRIZE, 2**
"Prince Albert of Baads," black, 3 **years, 3 months, 2 weeks, 2**
old; bred by Mr. George Reid, Baads, Peterculter, **Aberdeenshire**
"Bachelor" (690); dam, "Kate of Baads" **(1947), by "President**
(368).

THE MARQUIS OF HUNTLY, Aboyne Castle, Aberdeenshire: **SECOND**
10*l*., for "Monarch," black, **4 years, 3 months, 1 week, 6 days-old**
by exhibitor; sire, "Pluto" (602); dam, **"Madge" (1217), by "**
of Tillyfour" (509); g. d., **"Ruth of Tillyfour" (1169), by "**
Prince of Tillyfour" (366); **gr. g. d., "Beauty of Tillyfour 2nd" (1**
by "Young Jock" (4).

THE EARL OF STRATHMORE, Glamis Castle, Forfarshire: **THIRD I**
15*l*., for **"Bombastes" (1548), black, 2 years, 3 months, 2 we**
days-old; bred by exhibitor; sire, **"Neptune" (1152); dam, "B**
of Garline" (1247), by **"Victor of Ballindalloch" (403); g. d., "Jen**
(1245), by "Peter of Mulben" **(497); gr. g. d., "Corskie 2nd" (1**
by "Son of Beauty" (98).

GEORGE HAMILTON, Skene House, Aberdeen: **the *Reserve Number***
Highly Commended for "His Excellency," **black, 3 years, 5 mo**
1 week, 2-days old; bred by the Earl of Fife, Duff House, Banff;
"Young Viscount" (736); dam, "Violet of Montbletton" (1399
"Squire" (436); g. d., "Lady Ida" (1021), by "Black Diam
(464); gr. g. d., "Mayflower 2nd" (1020), by "The Earl" (291).

Polled Angus or Aberdeen Bulls, not exceeding Two Years old.[1]

HENRY D. ADAMSON, Balquharn, Alford, Aberdeenshire: **FIRST PRIZE,**
for "Knight of the Shire," black, **1 year, 5 months, 3 weeks, 5**
old; bred by exhibitor; sire, **"Dragon" (1178); dam, "Pride of Mu**
3rd" (3249), by "Elgin" **(724); g. d., "Pride of Mulben 3rd," by "**
Crow 4th" (352); **gr. g. d., "Pride of Aberdeen 5th," by "Bri**
(454).

THE EARL OF AIRLIE, K.T., Cortachy Castle, Kirriemuir, **Forfarshire: SE**
PRIZE, 10*l*., for "Ericson" **(1624), black, 1 year, 3 months, 3 wee**
days-old; bred by exhibitor; **sire, "Challenger;" dam, "Erica 4th,**
"Trojan;" g. d., "Erica 2nd," **by "Chieftain;" gr. g. d., "Erica,**
"Cupbearer."

JOHN HANNAY, Gavenwood, Banff, N.B.: **THIRD PRIZE, 5*l*., for "I**
Viscount" (1264), black, **1 year, 6 months-old; bred by exhibitor;**
"Young Viscount" (736); dam, **"Lilias of Tillyfour" (1795)**
"Black Prince of Wester Fowlis" **(619); g. d., "Pride of Aberdeen**
1174), by "Bright" (454); **gr. g. d., "Pride of Aberdeen" (531**
Hanton" (228).

GEORGE WILKEN FORBES, Waterside, Aberdeenshire: **the *Reserve Num***
"Waterside General" **(1546), black, 1 year, 11 months, 2 week**
bred by exhibitor; sire, "Carlos" (673); **dam, "Asloon Mary" (2**

*Polled Angus or Aberdeen Cows, in-calf or in-milk, Three Years old and upwards.**

Henry D. Adamson, Balquharn, Alford, Aberdeenshire: First Prize, 20*l.*, for "Sybil 2nd" (3526), black, 4 years, 2 months, 3 weeks-old; in-milk; calved March 11th, 1880; bred by the late W. McCombie, Tillyfour, Aberdeen; sire, "Sir Garnet" (684); dam, "Sybil 1st of Tillyfour," by "Sir William" (705); g. d., "Fancy" of Baads, by "President 4th" (368).

George Reid, Baads, Peterculter, Aberdeen: Second Prize, 10*l.*, for "Isla" (1965), black, 6 years, 1 month, 2 weeks, 1 day-old; in-milk; calved February 20th, 1880; bred by exhibitor; sire, "Sir William" (705); dam, "Fancy" (1948), by "President 4th" (368); g. d., "Maggie."

William Marshall Skinner, Drumin, Ballindalloch, Banffshire: Third Prize, 5*l.*, for "Sunshine 2nd" (3333), black, 4 years, 5 months, 5 days-old; in-milk; calved April 10th, 1880; bred by exhibitor; sire, "Byron" (639); dam, "Sunshine 1st" (1693), by "Baronet of Drumin" (637); g. d., "Beauty of Drumin" (959), by "Marshall" (399); gr. g. d., "Ruby" (951), by "Jim Crow" (344).

*Polled Angus or Aberdeen Heifers, under Three Years old.**

The Earl of Airlie, K.T., Cortachy Castle, Kirriemuir, Forfarshire: First Prize, 15*l.*, for "Pavilion" (3772), black, 2 years, 2 months, 3 weeks, 1 day-old; in-calf; bred by Mr. John Hannay, Gavenwood, Banff; sire, "Young Viscount;" dam, "Patience of Corskie," by "Clansman; g. d., "Heather Bell," by "Marshall;" gr. g. d., "Rose of Drumin," by "Defiance."

Henry D. Adamson, Balquharn, Alford, Aberdeenshire: Second Prize, 10*l.*, for "Pride of Aberdeen 19th," black, 2 years, 1 week, 4 days-old; in-calf; bred by exhibitor; sire, "Dragon" (1178); dam, "Regina," by "Jim Crow" (350); g. d., "Pride of Aberdeen 3rd," by "Black Prince" (366); gr. g. d., "Pride of Aberdeen," by "Hanton" (228).

John Hannay, Gavenwood, Banff: Third Prize, 5*l.*, for "Waterside Annie 2nd," black, 2 years, 7 months-old; in-calf; bred by Mr. George Wilken, Waterside, Alford, Aberdeenshire; sire, "Carlos" (673); dam, "Waterside Annie" (3205), by "Charlie 2nd" (1238); g. d., "Ann of Campfield" (2175), by "Charlie" (840); gr. g. d., "Violet of Campfield" (2173), by "Charlie" (840).

The Earl of Strathmore, Glamis Castle, Forfarshire: the *Reserve Number* to "Viola," black, 1 year, 6 months, 4 days-old; bred by exhibitor; sire, "St. Clair" (1160); dam, "Violet of Montbletton" (1399), by "Squire" (436); g. d., "Lady Ida" (1021), by "Black Diamond" (464); gr. g. d., "Mayflower 2nd" (1020), by "The Earl" (291).

*Pairs of Dairy Cows of any breed, in-milk.**

James Watt, Knowefield, Carlisle, Cumberland: First Prize, 20*l.*, for "Iresine," black, 4 years, 2 months-old. "Silene," red, 4 years, 2 months-old. Breeder unknown.

*Dairy Cows of any breed, in-milk.**

Lord Fitzhardinge, Berkeley Castle, Gloucestershire: First Prize, 10*l.*, for his fancy roan cross-bred shorthorn, 6 years-old; calved March [illegible] 1880; breeder unknown.

William Sawer, Threlkeld, Keswick, Cumberland: Second Prize, [illegible] his roan shorthorn, 5 years, 8 months-old; calved June, 1880; bred [illegible] exhibitor.

SHEEP.

Leicester Shearling Rams.

Teasdale Hilton Hutchinson, Manor House, Catterick, Yorkshire: Fir[illegible] Prize, 20*l.*, for his 1 year, 3 months, 2 weeks-old; bred by exhib[illegible]: sire, "Royal Liverpool;" sire of dam, "Prince Charlie."

Hebden Borton, Manor House, Barton-le-Street, Malton, Yorkshire: Sec[illegible] Prize, 10*l.*, for his 1 year, 3 months-old; bred by exhibitor.

Teasdale Hilton Hutchinson, Manor House, Catterick: Third Prize, [illegible] for his 1 year, 3 months, 3 weeks-old; bred by exhibitor; sire, "R[illegible] Liverpool."

Ernest Francis Jordan, Eastburn, Driffield, Yorkshire: the *Re[illegible] Number* and *Highly Commended* for his 1 year, 3 months-old; bred [illegible] the executors of the late Francis Jordan.

Leicester Rams of any other age.

Teasdale Hilton Hutchinson, Manor House, Catterick, Yorkshire: First Prize, 20*l.*, for his 2 years, 3 months, 2 weeks-old; bred by exhibitor: sire of dam, "Royal Liverpool."

Hebden Borton, Manor House, Barton-le-Street: Second Prize, 10*l.*, [illegible] his "Aggravation," 3 years, 3 months-old; bred by Exhibitor.

Teasdale Hilton Hutchinson, Manor House, Catterick: Third Prize, [illegible] for his "Doncaster," 3 years, 3 months, 3 weecks-old; bred by Mr. Borton.

Hebden Borton, Manor House, Barton-le-Street: the *Reserve Number* and *Highly Commended* for his "Lord Kilburn," 2 years, 3 months-old: bred by exhibitor.

Leicester Ewes—Pens of Five.

William Brown, High Gate House, Holme-on-Spalding-Moor, Yorkshire: First Prize, 15*l.*, for his shearling 1 year, 3 months-old; bred by exhibitor.

Ernest Francis Jordan, Eastburn, Driffield, Yorkshire: Second Prize, 10*l.*, for his 1 year, 3 months-old; bred by the executors of the late Fra[illegible] Jordan.

[illegible] Turner, jun., Thorpelands, Northampton: Third Prize, 5*l.*, [illegible] 1 year, 3 months, 2 weeks-old; bred by exhibitor.

Border Leicester Shearling Rams.

[illegible] Baillie Hamilton, Langton House, Dunse, Berwickshire: First Prize, 20*l.*, for his 1 year, 3 months, 3 weeks-old; bre[illegible] exhibitor.

WILLIAM WILSON, Wolfstan, Ormiston, Haddingtonshire: SECOND PRIZE, 10*l.*, for his 1 year, 3 months, 2 weeks-old; bred by exhibitor; sire, "Castlemain;" sire of dam, "Oldhamstocks."

SAMUEL JACK, of Mersington, Coldstream, N.B.: THIRD PRIZE, 5*l.*, for his 1 year, 3 months, 3 weeks-old; bred by exhibitor.

JAMES MELVIN, of Bonnington, Wilkieston, Mid-Lothian: the *Reserve Number* and *Highly Commended* for his 1 year, 3 months, 2 weeks-old; bred by exhibitor.

Leicester Rams of any other age.

ANDREW SMITH, Castlemains, Gifford, Haddingtonshire: FIRST PRIZE, 20*l.*, for his "Ralph," 3 years, 3 months, 3 weeks-old; bred by the late Marquis of Tweeddale, Newhall, Gifford.

ROBERT WATSON, Stone House, Hayton, Carlisle: SECOND PRIZE, 10*l.*, for "Henry the 8th," 3 years, 3 months-old; bred by Mr. George Simson, Courthill, Kelso, Roxburghshire.

SAMUEL JACK, Mersington: THIRD PRIZE, 5*l.*, for his 2 years, 3 months, 2 weeks-old; bred by exhibitor.

WILLIAM DINNING, Nilstone Ridge, Langley Mills, Northumberland: the *Reserve Number* and *Highly Commended* for "Nelson," 2 years, 3 months, 2 weeks-old; bred by exhibitor; sire, "Torrance."

Border Leicester Shearling Ewes—Pens of Five.

ROBERT WATSON, Stone House, Hayton, Carlisle: FIRST PRIZE, 15*l.*, for his 1 year, 3 months, 3 weeks-old; bred by exhibitor; sire, "Henry 8th."

JAMES NISBET, Lambden, Greenlaw, Berwick: SECOND PRIZE, 10*l.*, for his 1 year, 3 months, 2 weeks-old; bred by exhibitor.

WILLIAM DINNING, Nilstone Ridge: the *Reserve Number* to his 1 year, 3 months, 1 week-old; bred by exhibitor; sire, "Foster."

Cotswold Shearling Rams.

ROBERT JACOBS, Signett Hill, Burford, Oxon: FIRST PRIZE, 20*l.*, for his 1 year, 4 months, 2 weeks-old; bred by exhibitor: and SECOND PRIZE, 10*l.*, for his 1 year, 4 months, 2 weeks-old; bred by Exhibitor.

THOMAS BROWN, Marham Hall, Downham Market, Norfolk: THIRD PRIZE, 5*l.*, for his 1 year, 4 months, 2 weeks-old; bred by exhibitor: and the *Reserve Number* and *Highly Commended* for his 1 year, 4 months, 2 weeks-old; bred by exhibitor.

Cotswold Rams of any other age.

RUSSELL SWANWICK, the Royal Agricultural College Farm, Cirencester, Gloucestershire: FIRST PRIZE, 20*l.*, for his about 2 years, 5 months-old; bred by exhibitor.

THOMAS BROWN, Marham Hall: SECOND PRIZE, 10*l.*, for his 2 years, 4 months, 2 weeks-old; bred by exhibitor.

RUSSELL SWANWICK, the Royal Agricultural College Farm: THIRD PRIZE, 5*l.*, for his about 3 years, 5 months-old; bred by exhibitor.

THOMAS BROWN, Marham Hall: the *Reserve Number* and *Highly Commended* for his 2 years, 4 months, 2 weeks-old; bred by exhibitor.

Cotswold Shearling Ewes—Pens of Five.

THOMAS and STEPHEN GEORGE GILLETT, Kilkenny Farm, Faringdon, O FIRST PRIZE, 15*l.*, for their 1 year, 4 months, 2 weeks-old; bre exhibitors: and SECOND PRIZE, 10*l.*, for their 1 year, 4 mont weeks-old; bred by exhibitors.

Lincoln Shearling Rams.

HENRY SMITH, The Grove, Cropwell Butler, Nottingham: FIRST PRIZE, for his 1 year, 4 months-old: SECOND PRIZE, 10*l.*, for his 1 yea months-old: THIRD PRIZE, 5*l.*, for his 1 year, 4 months-old: and *Reserve Number* to his 1 year, 4 months-old; all bred by exhibitor.

Lincoln Rams of any other age.

HENRY SMITH: FIRST PRIZE, 20*l.*, for his 2 years, 4 months-old; b by Mr. Robert Wright, Nocton Heath, Lincoln; sire, "Black Kn and SECOND PRIZE, 10*l.*, for "Maréchale Bazaine," 3 years, 4 mont old; bred by the late Mr. W. F. Marshall, Branston, Lincoln.

WILLIAM SAVAGE, Hanging Bank, Penrith: THIRD PRIZE, 5*l.*, for his 2 yea 3 months, 2 weeks-old; bred by exhibitor.

JOHN BYRON, Kirkby Green, Sleaford, Lincolnshire: the *Reserve Number* a *Highly Commended* for his 3 years, 3 months-old; bred by exhibitor.

Lincoln Shearling Ewes—Pens of Five.

JOHN PEARS, Mere, Lincoln: FIRST PRIZE, 15*l.*, for his 1 year, 4 months-ol bred by exhibitor.

JOHN BYRON, Kirkby Green, Sleaford, Lincolnshire: SECOND PRIZE, 10*l.*, f his 1 year, 3 months, 2 weeks old; bred by exhibitor.

JOHN PEARS, Mere: THIRD PRIZE, 5*l.*, for his 1 year, 4 months-old; bred b exhibitor.

JOSEPH SEDGWICK, Lambrigg, Kendal: the *Reserve Number* and *Highly Co mended* for his 1 year, 3 months-old; bred by exhibitor.

Oxfordshire Down Shearling Rams.

JOHN TREADWELL, Upper Winchendon, Aylesbury, Bucks: FIRST PRI 20*l.*, for his about 1 year, 4 months, 2 weeks-old: SECOND PRIZE, 10 for his about 1 year, 4 months, 2 weeks-old: and THIRD PRIZE, 5*l.*, for h 1 year, 4 months, 2 weeks-old: and the *Reserve Number* for his abo 1 year, 4 months, 2 weeks-old; all bred by exhibitor.

Oxfordshire Down Rams of any other age.

JOHN TREADWELL: FIRST PRIZE, 20*l.*, for "Prince of Wales," about 2 yea 4 months, 2 weeks-old; bred by exhibitor; sire, "The Swell," sire dam, "Guildford:" and SECOND PRIZE, 10*l.*, for "Prince of the We about 2 years, 4 months, 2 weeks-old; bred by exhibitor; sire, "T Swell."

[illegible] ADAMS, Pidnell Farm, Faringdon, Berkshire: the *Reserve Num* and *Highly Commended* for "Kilburn," 2 years, 4 months, 2 weeks-o bred by exhibitor; sire, "Royal Oxford [illegible] sire of dam "Clarence."

Oxfordshire Down Shearling Ewes—Pens of Five.

Frederic Street, Somersham Park, St. Ives, Hunts: First Prize, 15*l.*, for his 1 year, 5 months-old; bred by exhibitor; sire, "Royal Bristol."

Southdown Shearling Rams.

H.R.H. the Prince of Wales, K.G., Sandringham, Norfolk: First Prize, 20*l.*, for his 1 year, 4 months-old; bred by His Royal Highness: and Second Prize, 10*l.*, for his 1 year, 4 months-old; bred by His Royal Highness.

Hugh Gorringe, Kingston-by-Sea, Brighton, Sussex: Third Prize, 5*l.*, for his about 1 year, 4 months, 2 weeks-old; bred by exhibitor.

Lord Walsingham, Merton Hall, Thetford, Norfolk: the *Reserve Number* and *Highly Commended* for his 1 year, 4 months-old; bred by exhibitor.

Southdown Rams of any other age.

The Duke of Richmond and Gordon, K.G., Goodwood, Chichester, Sussex: First Prize, 20*l.*, for his 2 years, 4 months-old; bred by exhibitor.

William Rigden, Ashcroft, Kingston-by-Sea, Shoreham, Sussex: Second Prize, 10*l.*, for his 2 years, 4 months-old; bred by exhibitor.

Hugh Gorringe, Kingston-by-Sea, Brighton, Sussex: Third Prize, 5*l.*, for his about 2 years, 4 months, 2 weeks-old; bred by exhibitor.

Sir Nicholas William Throckmorton, Bart., Buckland, Faringdon, Berks: the *Reserve Number* and *Highly Commended* for his 2 years, 4 months-old; bred by exhibitor.

Southdown Shearling Ewes—Pens of Five.

Lord Walsingham, Merton Hall, Thetford, Norfolk: First Prize, 15*l.*, for his 1 year, 4 months-old; bred by exhibitor.

Jeremiah James Colman, M.P., Carrow House, Norwich: Second Prize, 10*l.*, for his 1 year, 4 months-old; bred by exhibitor.

Sir Nicholas W. Throckmorton, Bart., Buckland: Third Prize, 5*l.*, for his 1 year, 4 months-old; bred by exhibitor.

H.R.H. the Prince of Wales, K.G., Sandringham: the *Reserve Number* and *Highly Commended* for his 1 year, 4 months-old; bred by His Royal Highness.

Shropshire Shearling Rams.

John Whitefoot Minton, Forton, Shrewsbury: First Prize, 20*l.*, for his 1 year, 4 months, 2 weeks-old; bred by exhibitor; sire, "Marquis of Bath;" sire of dam, "Bedford Hero."

Maria Barrs, Odstone Hall, Atherstone: Second Prize, 10*l.*, for her about 1 year, 4 months-old; bred by exhibitor.

John Whitefoot Minton, Forton: Third Prize, 5*l.*, for his 1 year, 4 months, 2 weeks-old; bred by exhibitor; sire, "Marquis of Bath;" sire of dam, "Bedford Hero."

James Lenox Naper, Loughcrew, Oldcastle, co. Meath, Ireland: the *Reserve Number* and *Highly Commended* for his 1 year, 3 months, 2 weeks-old; bred by exhibitor; sire, "Quality;" sire of dam, "Longbow."

Shropshire Rams of any other age.

Maria Barrs, Odstone Hall, Atherstone: **First Prize**, 20*l.*, for her a
2 years, 4 months-old; bred by exhibitor.

Richard Thomas, The Buildings, Baschurch, Salop: **Second Prize**, 10*l.*
his about 2 years, 4 months-old; bred by exhibitor.

James Lenox Naper, Loughcrew, Oldcastle, co. Meath, Ireland: **Third Pr**
5*l.*, for "Sir Guy," 2 years, 3 months, 2 weeks-old; bred by exhibi
sire, "Sir Gray" sire of dam, "Longbow."

John W. Minton, Forton, Shrewsbury: the *Reserve Number* and *Hi*
Commended for his 2 years, 4 months, 2 weeks-old; bred by Mr. Brom

Shropshire Yearling Ewes—Pens of Five.

George Graham, The Oaklands, Birmingham: **First Prize**, 15*l.*, for
1 year, 4 months, 2 weeks-old; bred by exhibitor; sire, "Georgius."

John Edward Farmer, Felton, Ludlow, Salop: **Second Prize**, 10*l.*, for
about 1 year, 4 months, 2 weeks-old; bred by exhibitor.

Joseph Beach, The Hattons, Brewood, Staffs.: **Third Prize**, 5*l.*, for
1 year, 4 months-old; bred by exhibitor.

John W. Minton, Forton, Shrewsbury: the *Reserve Number* and *Hig*
Commended for his 1 year, 4 months, 2 weeks-old; bred by exhibitor.

Hampshire and other Short-woolled Shearling Rams.

Alfred Morrison, Fonthill House, Tisbury, Wilts: **First Prize**, 20*l.*,
his Hampshire Down, 1 year, 5 months, 2 weeks-old; bred by exhibi
and **Second Prize**, 10*l.*, for his Hampshire Down, 1 year, 5 mon
1 week-old; bred by exhibitor.

Henry Lambert, Great Abington, Cambridge: **Third Prize**, 5*l.*, for
Hampshire Down, about 1 year, 4 months, 2 weeks-old; bred by e
bitor: and the *Reserve Number* and *Highly Commended* for his Ha
shire Down, about 1 year, 4 months, 1 week-old; bred by exhibitor.

Hampshire and other Short-woolled Rams of any other age.

Frank R. Moore, Littlecott, Pewsey, Wilts: **First Prize**, 20*l.*, for
Hampshire Down, 2 years, 4 months, 3 weeks-old; bred by exhibitor.

William Newton, Gould's Grove, Benson, Oxfordshire: **Second Prize**,
for his Hampshire Down, 2 years, 5 months, 2 weeks-old; bred by
A. Morrison, Fonthill House, Tisbury, Wilts.

Alfred Morrison, Fonthill House, Tisbury: **Third Prize**, 5*l.*, for
Hampshire Down, 2 years, 5 months-old; bred by exhibitor.

Henry Lambert, Great Abington: the *Reserve Number* and *Highly C*
mended for his Hampshire Down, about 2 years, 5 months, 2 weeks-
bred by Mr. J. Rigg, Wrotham Hill Park, Sevenoaks, Kent.

ampshire and other Short-woolled Shearling Ewes—Pens of Fi

ank R. Moore, Littlecott, Pewsey, Wilts: **First Prize**, 15*l.*, fo
Hampshire Down, about 1 year, 4 months, 2 weeks-old; bred by
itor.

Lambert, Great Abington, Cambridge: **Second Prize**, 10*l.*, fo
ampshire Down, about 1 year, 5 months-old; bred by exhibitor.

William Newton, Gould's Grove, Benson, Oxon: Third Prize, 5*l.*, for his Hampshire Down, 1 year, 5 months, 2 weeks-old; bred by exhibitor.

Cheviot Shearling Rams.

Thomas Elliot, Hindhope, Jedburgh, N.B.: First Prize, 10*l.*, for his 1 year, 3 months-old; bred by exhibitor; sire, "Clansman."

John Robson, Birness, Otterburn, Northumberland: Second Prize, 5*l.*, for his 1 year, 3 months-old; bred by exhibitor: and the *Reserve Number* and *Highly Commended* for his 1 year, 3 months-old; bred by exhibitor.

Cheviot Rams of any other age.

Thomas Elliot, Hindhope, Jedburgh, Roxburghshire: First Prize, 10*l.*, for his 2 years, 3 months-old; bred by exhibitor: and Second Prize, 5*l.*, for "Clansman," 4 years, 3 months-old; bred by exhibitor; sire, "The Gentleman."

John Robson, Birness; the *Reserve Number* and *Highly Commended* for "The Masterpiece," 4 years, 3 months-old; bred by exhibitor.

Cheviot Shearling Ewes—Pens of Five.

Thomas Elliot, Hindhope, Jedburgh, Roxburghshire: First Prize, 10*l.*, for his 1 year, 3 months, 1 week-old; bred by exhibitor; sire, "Sir Walter."

John Robson, Birness: the *Reserve Number* and *Highly Commended* for his 1 year, 3 months-old; bred by exhibitor.

Black-faced Mountain Shearling Rams.

James Moffat, Gateside, Sanquhar, Dumfries: First Prize, 10*l.*, for his 1 year, 2 months, 2 weeks-old; bred by exhibitor.

James Craig, Monktonhill, Monkton, Ayrshire: Second Prize, 5*l.*, for his "The Law," 1 year, 2 months, 2 weeks-old; bred by exhibitor.

Charles Howaston, Glenbuck, Muirkirk, Ayrshire: Third Prize, 3*l.*, for his 1 year, 3 months-old; bred by exhibitor: and the *Reserve Number* and *Highly Commended* for his 1 year, 3 months-old; bred by exhibitor; sire, "Beaconsfield," sire of dam, "Black Diamond 1st."

Black-faced Mountain Rams of any other age.

James Moffat, Gateside, Sanquhar, Dumfries: First Prize, 10*l.*, for "Wee Twin," 3 years, 3 months-old; bred by exhibitor; sire, "Speckie;" sire of dam, "Gareland Mark."

Charles Howatson, Glenbuck, Muirkirk, Ayrshire: Second Prize, 5*l.*, for "Black Diamond 6th"; bred by exhibitor; sire, "Beaconsfield;" sire of dam, "Black Diamond the 1st": Third Prize, 3*l.*, for "Beaconsfield," 3 years, 3 months-old; bred by exhibitor; sire, "Alston;" sire of dam, "Black Diamond": and the *Reserve Number* and *Highly Commended* for "Blind-man's Brother," 2 years, 3 months-old; bred by exhibitor; sire, "Beaconsfield;" sire of dam, "Black Diamond the 1st."

Black-faced Mountain Shearling Ewes—Pens of Five.

Charles Howatson, Glenbuck, Muirkirk, Ayrshire: First Prize, 10*l.*, for 1 year 3 months-old; bred by Exhibitor; sire, "Beaconsfield."

MATTHEW HENDERSON, The Hope, Allendale Town: **SECOND PRIZE**, 5*l.*, his about 1 year, 2 months-old; bred by Mr. Robert Lee, The H Allendale Town: and **THIRD PRIZE**, 3*l.*, for his 1 year, 2 months- bred by Mr. Robert Lee, The Hope, Allendale Town.

JOHN IRVING, Shap Abbey, Shap, Westmoreland, the ***Reserve Number*** *Highly Commended* for his 1 year, 3 months-old; bred by exhibitor.

Herdwicks, Shearling Rams.

EDWARD HAWELL, Lonscale, Keswick: **FIRST PRIZE**, 10*l.*, for his 1 y 2 months, 2 weeks-old; bred by exhibitor; sire "Royal George."

GEORGE BROWNE, Troutbeck, Windermere, Westmoreland: **SECOND PRIZE**, for "Wansfell," 1 year, 3 months-old; bred by exhibitor; sire, "Bow sire of dam, "Dodgson:" and **THIRD PRIZE**, 3*l.*, for "Beaconsfield," 1 y old; bred by exhibitor; sire, "Bowe;" sire of dam, "Dodgson."

EDWARD HAWELL, Lonscale: the ***Reserve Number*** and ***Highly Commen*** for "Oswald," 1 year, 2 months, 1 week-old; bred by exhibitor; s "Dash."

Herdwicks, Rams of any other age.

JOHN NEWBY, Muncaster Head, Holm Rook, Cumberland: **FIRST PRIZE**, 1 for "Just in Time," 4 years, 3 months, 1 week-old; bred by exhibito

EDWARD HAWELL, Lonscale: **SECOND PRIZE**, 5*l.*, for "Flockmaster," 5 ye 2 months, 2 weeks-old; bred by exhibitor; sire, "Collingwood."

EDWARD NELSON, Gatesgarth, Buttermere, Cockermouth: **THIRD PRIZE**, for "Toby Smart," 7 years-old; bred by exhibitor; sire, "Gatesg Boggle;" sire of dam, "Mango:" and the ***Reserve Number*** and ***Hig*** *Commended* for "Beggar Lad," 3 years-old; bred by exhibitor; s "Bustoo;" sire of dam, "Mango."

Herdwicks, Shearling Ewes—Pens of Five.

EDWARD HAWELL, Lonscale, Keswick: **FIRST PRIZE**, 10*l.*, for his 1 y 2 months, 2 weeks-old; bred by exhibitor; sire, "Royal George."

WILLIAM LEATHES, Lamplugh Hall, Cockermouth, Cumberland: **SEC PRIZE**, 5*l.*, for his 1 year, 3 months, 2 weeks-old; bred by Mr. Browne, Troutbeck, Windermere.

EDWARD NELSON, Gatesgarth, Cockermouth, Cumberland: **THIRD PRIZE**, for his 1 year, 1 month-old; bred by exhibitor.

THOMAS AINSWORTH, The Flosh, Cleator, Carnforth: the ***Reserve Number*** *Highly Commended* for his 1 year, 2 months-old; bred by exhibitor.

Herdwick Ewes—Pens of Five, with their Lambs.†

JOHN NEWBY, Muncaster Head, Holm Rook, Cumberland: **THE PRIZE** 10*l.* 10*s.*; bred by exhibitor.

EDWARD NELSON, Gatesgarth, Buttermere, Cockermouth: the ***Res*** *Number*; bred by exhibitor.

Lonks, Shearling Rams.

JONATHAN PEEL, Knowlmere Manor, Clitheroe, Yorkshire: **FIRST PRIZE**, for his 1 year, 3 months, 1 week-old; bred by exhibitor.

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† Given by Lord Leconfield.

David Lambert and Son, Bank House, Silsden, Leeds: Second Prize, 5*l.*, for their 1 year, 2 months, 3 weeks-old; bred by Mr. W. Anderton, Sheriff Bingley, Yorks.

Frederick Harrison, Long Lee, Keighley, Yorkshire: Third Prize, 3*l.*, for his 1 year, 2 months-old; bred by exhibitor.

David Lambert and Son; the *Reserve Number* and *Highly Commended* for their 1 year, 2 months, 3 weeks-old; bred by Messrs. J. Green and Son, Low House Farm, Silsden.

Lonks, Rams of any other age.

Jonathan Peel, Knowlmere Manor, Clitheroe: First Prize, 10*l.*, for his 3 years, 3 months, 2 weeks-old; bred by exhibitor.

David Lambert and Son, Bank House, Silsden, Leeds: Second Prize, 5*l.*, for their 2 years, 2 months-old; bred by Messrs. John Green and Son, Low House Farm, Silsden: and Third Prize, 3*l.*, for their 4 years, 3 months, 1 week-old; bred by Mr. John Widdop, Howdengate, Silsden.

Lonks, Shearling Ewes—Pens of Five.

David Lambert and Son, Bank House, Silsden, Leeds: First Prize, 10*l.*, for their 1 year, 2 months-old; bred by Messrs. John Green and Son, Low House Farm, Silsden: and Second Prize 5*l.*, for their 1 year, 2 months-old; bred by Mr. William Duerden, Town House, Nelson, Lancashire.

Frederick Harrison, Long Lee, Keighley: Third Prize, 3*l.*; bred by exhibitor.

Long-woolled Rams, not qualified for the preceding Classes.

William and George Bird, Volis, Kingston, Taunton, Somerset: First Prize, 10*l.*, for their Devon Long Wool, 1 year, 5 months-old; bred by exhibitors; and Second Prize, 5*l.*, for their Devon long-wool, 1 year, 5 months-old; bred by exhibitors.

John Willis, Jun., Carperby, Bedale, Yorks.: the *Reserve Number* to his Wensleydale Long Wool, 1 year, 3 months-old; bred by exhibitor.

Long-woolled Rams of any other age, not qualified for the preceding Classes.

William and George Bird, Volis, Kingston, Taunton: First Prize, 10*l.*, for their Devon Long Wool, 2 years, 5 months-old; bred by exhibitors: and Second Prize, 5*l.*, for their Devon Long Wool, 2 years, 5 months-old; bred by exhibitors.

John Willis, Jun., Carperby, Bedale: the *Reserve Number* and *Highly Commended* for his Wensleydale Long Wool, 2 years, 4 months-old; bred by Mr. Joseph Raw, Carperby, Bedale.

Long-woolled Shearling Ewes, not qualified for the preceding Classes—Pens of Five.

John Willis, Jun.: First Prize, 10*l.*, for his Wensleydale Long Wool, 1 year, 3 months-old; bred by exhibitor.

PIGS.

Large White Breed—Boars, above Six Months and not exceeding 1 Months old.

The Earl of Ellesmere, Worsley Hall, Manchester: **First Prize,** for his 11 months, 3 days-old; bred by exhibitor; sire, "Tiger dam, "Lady Worsley," by Peter the Great": and **Second Prize,** 5 his 11 months, 3 days-old; bred by exhibitor; sire, "Tiger 2nd;" "Lady Worsley," by "Peter the Great."

Large White Breed—Boars, above Twelve Months old.

The Earl of Ellesmere: **First Prize,** 10*l.*, for "Samson 4th," 3 6 months-old; bred by exhibitor; sire, "Samson;" sire of dam, " shire Lad."

Sanders Spencer, Holywell Manor, St. Ives, Hunts: **Second Prize,** 5*l.* "Sampson 6th," 1 year, 11 months, 3 weeks, 6 days-old; bre exhibitor; sire, "Sampson 2nd;" dam, "Giantess."

Large White Breed—Pens of three Breeding Sow Pigs of the sa Litter, above Three and not exceeding Six Months old.

The Earl of Ellesmere, Worsley Hall, Manchester: **First Prize,** 10*l.* his 5 months, 3 weeks, 4 days-old; bred by exhibitor; sire, "Jose sire of dam, "Prince."

Robert Tommas, Winson Green, Birmingham: **Second Prize,** 5*l.*, fo 5 months, 3 weeks, 2-days old; bred by exhibitor; sire, "Billy;" "Maida," by "Samson."

Alfred Crowther, Star Inn, Bridge Street, Bury, Lancashire: the *Re Number* and *Highly Commended* for his 5 months, 3 weeks-old; by exhibitor; sire, "Samson;" dam, "Lancashire Lass 2nd," by Ne

Large White Breed—Breeding Sows.

The Earl of Ellesmere, Worsley Hall, Manchester: **First Prize,** for his 5 years, 6 months-old; bred by Mr. M. Walker, Derby; "Samson;" sire of dam, "Victor 2nd": and **Second Prize,** 5*l.*; ag breeder unknown.

Alfred Crowther, Star Inn, Bridge Street, Bury: the *Reserve Numbe Highly Commended* for "Princess," 1 year, 10 months, 2 weeks-old; by exhibitor; sire, "Hero;" dam, "Empress."

Small White Breed—Boars, above Six and not exceeding Twel Months old.

The Earl of Ellesmere, Worsley Hall, Manchester: **First Prize,** for his 11 months, 2 weeks-old; bred by exhibitor; sire, "Marq dam, "Wharfdale Queen."

Sanders Spencer, Holywell Manor, St. Ives, Hunts: **Second Prize,** 5 "Sobersides," 11 months, 3 weeks, 6 days-old; bred by exhibitor; "Pat;" dam, "Oh Yes," by "The Czar."

Small White Breed—Boars, above Twelve Months old.

The Earl of Ellesmere: **First Prize,** 10*l.*, for "Robin Hood," 1

9 months, 3 weeks-old; bred by exhibitor; sire, "King of the Peacocks;" sire of dam, "Toxophilite": and **Second Prize**, 5*l.*, for "The Swell," 2 years, 10 months, 3 weeks-old; bred by exhibitor; sire, "XL;" dam, "Nelly Farren."

Small White Breed—Pens of Three Breeding Sow Pigs of the same Litter, above Three and not exceeding Six Months old.

The Earl of Ellesmere: **First Prize**, 10*l.*, for his 5 months, 3 weeks, 2 days-old; bred by exhibitor; sire, "Marquis;" dam, "Curly."

Robert Tommas, Winson Green, Birmingham: **Second Prize**, 5*l.*, for his 5 months, 2 weeks, 4 days-old; bred by exhibitor; sire, "Wonder;" dam, "Venus," by "Dwarf."

Small White Breed—Breeding Sows.

Sanders Spencer, Holywell Manor, St. Ives, Hunts: **First Prize**, 10*l.*, for his 11 months, 3 weeks, 6 days-old, in-pig; bred by exhibitor; sire, "Pat;" dam, "Oh Yes," by "The Czar."

Philip Ascroft, Rufford, Ormskirk, Lancashire: **Second Prize**, 5*l.*, for "Nellie," 1 year, 6 months-old; bred by Mr. Samuel Wilson, Tanner's Farm, Ramsbottom, Lancashire; dam, "Worsley," by "Darby Boy."

Charles Elmhirst Duckering, Northorpe, Kirton Lindsey, Lincolnshire: the *Reserve Number* and *Highly Commended* for his 1 year, 6 months, 2 days-old; bred by exhibitor.

Small Black Breed—Boars, above Twelve Months old.

The Rev. William Hooper, Chilfrome Rectory, Dorchester, Dorset: **First Prize**, 10*l.*, for "Gipsy King," 1 year, 1 month, 1 week-old; bred by exhibitor; sire, "Sultan."

Charles Elmhirst Duckering, Northorpe, Kirton Lindsey, Lincolnshire: **Second Prize**, 5*l.*, for his 1 year, 9 months, 2 weeks-old; bred by exhibitor.

Small Black Breed—Pens of Three Breeding Sow Pigs of the same Litter, above Three and not exceeding Six Months old.

The Rev. William Hooper, Chilfrome Rectory, Dorchester: **First Prize**, 10*l.*, for his 3 months, 2 weeks, 5 days-old; bred by exhibitor; sire, "Black Prince;" dam, "Aunt Sally."

Small Black Breed—Breeding Sows.

Charles Elmhirst Duckering, Northorpe, Kirton Lindsey: **First Prize**, 10*l.*, for his 1 year, 8 months, 1 week-old; bred by exhibitor: and **Second Prize**, 5*l.*, for his 1 year, 8 months, 1 week-old; bred by exhibitor.

Berkshires—Boars, above Six Months and not exceeding Twelve Months old.

Edward Tombs, Shilton, Bampton, Oxfordshire: **First Prize**, 10*l.*, for "Surprize," 11 months, 3 weeks, 2 days-old; bred by Mr. William Tombs, Shorts, Lechlade; sire, "Hercules," dam, "Langford Lass," by "Trumpeter."

RUSSELL SWANWICK, Royal Agricultural College Farm, Cirencester, Gloucestershire: SECOND PRIZE, 5*l.*, for his 6 months, 2 weeks-old; bred by exhibitor; sire, "Spiteful 2nd;" dam, "Dark Hopeful," by "Sully 7th."

Berkshires—Boars, above Twelve Months old.

EDWARD TOMBS, Shilton, Bampton: FIRST PRIZE, 10*l.*, for "Tim Whiffler," 2 years, 3 weeks, 4 days-old; bred by Mr. William Tombs, Shorts, Lechlade; sire, "Timothy;" dam, "Langford Lass," by "Trumpeter."

RUSSELL SWANWICK, Royal Agricultural College Farm: SECOND PRIZE, 5*l.*, for "Duke of Newport," 1 year, 11 months, 2 weeks, 2 days-old; bred by exhibitor; sire, "Spiteful 2nd;" dam, "Sally 22nd," by "Oxford."

Berkshires—Pens of Three Breeding Sow Pigs of the same Litter, above Three and not exceeding Six Months old.

THE EXECUTORS OF THE LATE ARTHUR STEWART, Saint Bridge Farm, Gloucester: FIRST PRIZE, 10*l.*, for their 5 months, 3 days-old; bred by exhibitors; sire, "Scothern;" dam, "Lady Kingscote 2nd" by "Prodigal."

RUSSELL SWANWICK, Royal Agricultural College Farm: SECOND PRIZE, 5*l.*, for his 4 months, 3 weeks-old; bred by exhibitor; sire, "Spiteful 2nd;" dam, "Stumpy 10th," by "Emulation."

Berkshires—Breeding Sows.

THE EXECUTORS OF THE LATE ARTHUR STEWART: FIRST PRIZE, 10*l.*, for their 1 year, 5 months, 1 day-old; in-pig; bred by the late Arthur Stewart; sire, "Prodigal;" dam, "Sister A." by "Sir Leonard."

RUSSELL SWANWICK: SECOND PRIZE, 5*l.*, for his "Sally 11th," 1 year, 8 months-old; in-pig; bred by exhibitor; sire, "The Wizard;" dam, "Sally 10th," by "H. 2."

THE EXECUTORS OF THE LATE ARTHUR STEWART: the *Reserve Number* and *Highly Commended* for their 1 year, 5 months, 2 days-old; in-pig; bred by the late Arthur Stewart; sire, "Prodigal;" dam, "Cirencester," by "Royal Pennant."

Other Breeds—Boars, above Six and not exceeding Twelve Months old.

WILLIAM SIMISTER, 43, Middle Hillgate, Stockport, Cheshire: FIRST PRIZE, 10*l.*, for "Torthey," white, 11 months, 1 week, 4 days-old; bred by exhibitor; sire, "Bruce;" dam, "Woodland Mary."

JOHN and JOSEPH NUTTALL, 13, Long Field, Haywood, Lancashire: SECOND PRIZE, 5*l.*, for "Hero," white, 9 months, 1 week, 5 days-old; bred by exhibitors; sire, "Gladstone;" dam, "Snowdrop," by "Albert."

Other Breeds—Boars, above Twelve Months old.

[illegible] EARL OF ELLESMERE, Worsley Hall, Manchester: FIRST PRIZE, 10*l.*, for King Duncan," white, 2 years, 4 months-old; bred by exhibitor; sire, Scottish Chief;" sire of dam, "Duke of Lancaster."

[illegible] OMMAS, Winson Green, Birmingham: SECOND PRIZE, 5*l.*, for uch," white, 1 year, 10 months, 1 week, 3 days-old; bred by exhibitor; sire, "Esau;" dam, "Eve," by "Duke of York."

JOHN and JOSEPH NUTTALL, 13, Long Field, Haywood, Lancashire: SPECIAL PRIZE, 3*l.*, for "Bill," white with blue spots, 2 years, 4 months-old; bred by Mr. Samuel Wilson, Ramsbottom, Lancashire; sire, "Bill;" dam, "Duchess," by "Dreadnought."

Other Breeds—Pens of Three Breeding Sow Pigs of the same Litter, above Three and not exceeding Six Months old.

THE EARL OF ELLESMERE, Worsley Hall: FIRST PRIZE, 10*l.*, for his white, 5 months, 3 weeks, 4-days-old; bred by exhibitor; sire, "Peter;" sire of dam, "Shorthead."

ALFRED CROWTHER, Star Inn, Bridge Street, Bury, Lancashire: SECOND PRIZE, 5*l.*, for his white, 5 months, 3 weeks, 1 day-old; bred by exhibitor; sire, "Star;" sire of dam, "Albert."

Other Breeds—Breeding Sows.

THE EARL OF ELLESMERE: FIRST PRIZE, 10*l.*, for "Lady Worsley," white, 3 years, 2 months, 2 days-old; bred by exhibitor; sire, "Peter the Great;" dam, "Queen Bee."

SANDERS SPENCER, Holywell Manor, St. Ives, Hunts: SECOND PRIZE, 10*l.*, for his "Silver Hair," white, 1 year, 11 months, 3 weeks, 6 days-old; bred by exhibitor; sire, "Sampson 2nd;" dam, "Oh Joy," by "Hero."

ALFRED CROWTHER, Star Inn, Bridge Street, Bury, Lancashire: the *Reserve Number* and *Highly Commended* for "Duchess 2nd," white, 1 year, 8 months, 4 days-old; bred by exhibitor; sire, "Albert;" dam, "Duchess 1st," by "Bill 1st."

BUTTER.

Six lbs. of Fresh Butter.

CHRISTOPHER MILLICAN, Johnby, Greystoke, Penrith: FIRST PRIZE, 6*l.*†

ARABELLA PRESCOTT, Birchen Farm, Tenbury: SECOND PRIZE, 5*l.*†

ANNE ROBINSON, Weathericks, Clifton Dykes, Penrith: THIRD PRIZE, 4*l.*†

ROBERT CORVIN, Thwaite Hall, Greystoke, Penrith: FOURTH PRIZE, 3*l.**

MARY DOBSON, Greens Burn, Brampton, Cumberland: FIFTH PRIZE, 2*l.**

*One Firkin of Butter.**

CHRISTOPHER MILLICAN, Johnby, Greystoke, Penrith: FIRST PRIZE, 6*l.*

HANNAH WATSON, Easton, Burgh-by-Sands, Carlisle: SECOND PRIZE, 5*l.*

THOMAS TWEDDLE, Asherton Castle, Brampton, Cumberland: THIRD PRIZE, 4*l.*

JOHN BARKER, Rangleton, Carlisle: FOURTH PRIZE, 3*l.*

MARY ANN FENTON, Red Kirk, Annan, N.B.: FIFTH PRIZE, 2*l.*

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† Given in plate by J. A. Wheatley, Esq.

IMPLEMENTS.

J. and H. McLAREN, Leeds, SPECIAL SILVER MEDAL for their Patent Broadside Steam Digger; invented by T. C. Darby, of Chelmsford.

G. W. MURRAY and Co., Banff Foundry, Scotland, SILVER MEDAL for their Two-Row Potato Planter.

JOHN CROWLEY and Co., Meadow Hall Ironworks, Sheffield, SILVER MEDAL for their Patent Horse Gear.

BARFORD and PERKINS, Peterborough, SILVER MEDAL for their Self-lifting Apparatus, applied to Steam Cultivating Implements.

CHARLES BURRELL and SONS, Thetford, Norfolk, SILVER MEDAL for their Universal Ploughing and Traction Engine. (Everitt's Patent.)

NALDER and NALDER, Wantage, Berks, SILVER MEDAL for their Steam Elevator attached to Threshing Machine.

FARM PRIZES.

Arable or Mixed Farms, above 200 acres.

WILLIAM HANDLEY, Greenhead, Milesthorpe: FIRST PRIZE, 40*l.**

JOSEPH LOWTHIAN, Winder Hall, Tirril, Penrith: SECOND PRIZE, 20*l.**

WILLIAM ATKINSON, Burneside Hall, Kendal: SPECIAL PRIZE, 10*l.*

Arable or Mixed Farms, not less than 50 and not over 200 acres.

THOMAS DONALD, Sandon House, Abbey Town, Silloth: FIRST PRIZE, 35*l.**

THE EXECUTORS OF THE LATE ROWLAND PARKER, Moss End, Burton, Westmoreland: SECOND PRIZE, 20*l.**

WILLIAM BENSON, Boonwood, Gosford: SPECIAL PRIZE, 10*l.*

Stock or Pastoral Farms, above 200 acres.

WILLIAM LEATHES, Lamplugh Hall, Cockermouth: FIRST PRIZE, 35*l.**

JAMES MOUNCEY, High Laton, Cockermouth: SECOND PRIZE, 20*l.**

AGRICULTURAL EDUCATION.

Examination Papers, 1880.

EXAMINATION IN AGRICULTURE.

MAXIMUM NUMBER OF MARKS, 200. PASS NUMBER, 100.

Tuesday, April 13th, from 10 *a.m. till* 1 *p.m.*

1. In selecting a farm for profitable occupation of from 300 to 400 acres in extent, what considerations would chiefly guide you in your selection—

1st. Supposing such farm to be wholly or chiefly arable,
2nd. If such farm were all in grass,
3rd. If mixed in the proportion of one-half or two-thirds grass?

2. What special features should a farm have to render it suitable for the production of milk for sale?

3. What prices per lb. of cheese and butter would pay as well as selling milk at 8*d*. per imperial gallon at the farm, or contiguous railway station?

4. What sort of arable land most needs conversion into permanent pasture?

5. Describe strictly the operation of seeding down permanent pasture, and its after treatment.

6. What is the cheapest mode of improving poor rough pasture on clay soil already drained, or not requiring drainage?

7. State the advantages of feeding cattle with cake whilst at grass—

1st. For producing beef,
2nd. For producing milk.

8. Prime fodder and roots having been unusually scarce in the past winter, state what kinds and proportions of purchased foods may have been most usefully and economically given, and the weekly cost in each case of such extra food—

1. To dairy cows in full milk,
2. To young growing cattle,
3. To fattening beasts.

9. Describe shortly an economical method of rearing calves.

10. If on a strong or loamy soil oats or barley be sown after wheat, describe the best time and mode of sowing, and state what artificial manure is suitable for application to the crop.

11. What are the chief agricultural uses of lime, and to what is its application most beneficial?

12. Describe shortly the cultivation of mangolds, swedes, and v turnips, and state what soil and climate are most favourable to crop.

13. What are the chief advantages of the use of the mowing macl and the reaping machine?

14. What artificial manures are most beneficially applied to wheat-crop? State the quantities and probable cost of each ma and the best time of application.

15. State for what purposes you consider that pigs may profit be kept, and what changes the great increase in the importatio foreign bacon is bringing about in our pig breeding and feeding.

16. Contrast the merits of the following breeds of sheep:—

The Lincoln, the Cotswold, the Southdown, and the Shropsh

17. Describe the special merits of the following breeds of cattle

Shorthorns, Herefords, Ayrshires, Channel Islands.

18. State the advantages of covered yards for cattle in winte compared with open yards.

EXAMINATION IN CHEMISTRY.

MAXIMUM NUMBER OF MARKS, 200. PASS NUMBER, 100.

Wednesday, April 14th, from 10 a.m. till 1 p.m.

I. GENERAL CHEMISTRY.

1. Describe the chief characters of the following elements—nit gen, sulphur, lead, copper. What compounds do they severally fo with oxygen?

2. State the chemical composition (or the chief components) of cha charcoal, flint, gypsum, oyster shells, bricks, water. Explain h hard water differs from soft water.

3. What is meant by neutralising an acid? Calculate how mu dry carbonate of soda is required to neutralise a solution contain 00 grs. of nitric acid, and how much to neutralise a solution c ining 100 grs. of phosphoric acid; and send up your calculati C : N : O : P : Na = 12 : 14 : 16 : 31 : 23).

. Describe a method of determining the amount of moisture pres he atmosphere at any time and place. How do you account comparative dryness of a N.E. wind?

. Describe and explain ordinary methods of preparing (1) chlor sulphuretted hydrogen, (3) caustic potash. Explain the chem action of each of these substances with each (separately) of the other two.

6. What are the principal products of combustion of (1) a coal fire, (2) a candle, (3) a lucifer match? In making coal-gas considerable quantities of ammonia are procured: what becomes of the elements of the ammonia when the coal is burnt in an ordinary fire?

7. State the relations between cane-sugar, grape-sugar, and starch. By what chemical tests can they be distinguished? Explain the chemical changes effected in the fermentation of beer.

8. What are the distinctive characters of colloid and crystalloid substances? Give examples of such substances. To which class do you refer sugar, gum, aluminium hydrate, nitre, ferric hydrate, sulphate of ammonia, respectively?

9. What are fatty acids, and what are the properties on account of which they are called "acids"? Explain their relation to fats.

II. AGRICULTURAL CHEMISTRY.

Wednesday, April 14th, from 2 p.m. till 5 p.m.

1. Describe the process of paring and burning and of clay-burning. What are the changes which take place in burning clay?

2. Mention some of the chemical and physical peculiarities of clay and sandy soils, and show how these peculiarities affect the rational cultivation of stiff clay land and light sandy soils.

3. Write a short paper on the composition of lime, chalk, marl, and shell-sand, and their application in agriculture.

4. What are the effects of salts of potash, nitrate of soda, sulphate of ammonia, and superphosphate of lime on the mixed herbage of permanent pasture?

5. Mention the general composition of soot. How do you determine its agricultural and commercial value, and for what crops is it most suitable as a manure? When should it be applied to the land?

6. How much have you to pay for the unit per cent. of nitrogen in nitrate of soda guaranteed to contain 95 per cent. of pure nitrate of soda, and costing 19*l*. 10*s*. per ton, and in sulphate of ammonia, containing 24 per cent. of ammonia, and also costing 19*l*. 10*s*. a ton?

7. Write a short paper on butter-making.

8. Give an account of the causes of the benefits of growing clover as a preparation for the succeeding wheat-crop.

9. Point out the more striking differences in the composition of the following feeding stuffs:—beans, indian corn, rice meal, oats, linseed-cake, decorticated and undecorticated cotton-cake.

EXAMINATION IN MECHANICS AND NATURAL PHILOSOPHY.

MAXIMUM NUMBER OF MARKS, 200. PASS NUMBER, 100.

Thursday, April 15*th, from* 10 *a.m. till* 1 *p.m.*

1. State the conditions of equilibrium of three forces acting o particle.

Show by a construction or otherwise how forces of 12, 15, and units must be adjusted so as to keep a particle at rest.

2. State briefly how force is transmitted along a thread.

A body weighing 5 lbs. hangs from an end of a thread; if I p my finger against the thread so as to bring the upper part into inclined position, while the lower part (of course) hangs vertica how would the pressure on my finger be found? In what posit would the pressure exactly equal the weight?

3. The handle of a hammer is 15 inches long and weighs $\frac{1}{2}$ lb.; head weighs 2 lbs.; the centre of gravity of the handle is in middle point, and that of the head is $\frac{1}{2}$ inch from the end of handle; where will the centre of gravity of the hammer be?

4. It has been ascertained that a man acting on a winch can work at the rate of 1,200,000 foot pounds of work in a day of 8 ho If two men can lift a ton through 15 feet in 10 minutes, by mean a properly constructed crane, how much of their work is wasted friction?

5. When is the velocity of a body said to be uniformly accelerat If the acceleration be 10 when the units are feet and seconds, w distance will the body describe while its velocity is increased f 11 feet a second to 44 feet a second. If the mass of the bod 100 lbs. what force would be required to produce the acceleration

6. Describe the hydrometer in any one form. An ordinary hy meter, whose stem is of uniform section, sinks to a certain point A distilled water, and to another point B in a liquid whose spe gravity is 0·96; find, in terms of A B, the distance from A to surface when the hydrometer is placed in a liquid whose spe gravity is $\frac{16}{17}$ths.

7. Distinguish between heat and temperature. Mention any umstances in which heat may be communicated to a body witl nanging its temperature.

8. State the relation between the volume, pressure and tempera a given quantity of gas. A cubic foot of dry air is inclo ithout compression or rarefaction, when the thermometer stand 0° F. and the barometer at 30 inches; if the temperature of the ised to boiling point without change of volume, what pres ert per square inch on the surface that incloses it?

scribe briefly the steam indicator, and how the indicator [illegible] and what it indicates

EXAMINATION IN MENSURATION AND SURVEYING.

MAXIMUM NUMBER OF MARKS, 100. PASS NUMBER, 50.

Thursday, April 15th, from 2 *p.m. till* 5 *p.m.*

1. Find the area, in acres, &c., of a border 40 ft. wide which goes all round a rectangular field 500 yards long and 330 yards wide.

2. Calculate, in tons per acre, the weight of a quarter of an inch rainfall. (A cubic foot of water weighing 1000 oz.)

3. State the rules for finding the volume and surface of a cylinder and cone. How would you deduce the volumes of the parts into which a cone is divided by a plane parallel to its base?

4. Reckoning that a horse can draw a ton weight, in addition to that of the vehicle, how many horses should be set to draw 25 fir trunks, each 32 feet long and 18 inches in diameter at the base. (Specific gravity of fir wood being 0·64.)

5. A rectangular heap of stones is formed on a base 20 feet long and 8 feet wide; the slope on all sides is one vertical to one horizontal; if it is made as high as possible what are its dimensions and volume?

6. There are four points A, B, C, D, marked on the ground, *e.g.*, by flag staffs or by trees, and the area of the ground inclosed by A B C D is required; it is found impracticable to measure the sides of the quadrilateral figure; accordingly the diagonal A C is measured, and it is required to mark on it the feet (M, N) of the perpendiculars drawn to it from B and D. How could this be done? And if done, how would it help you to find the required area?

7. In the last example suppose that A C is 1200 yards, A N 500 yards, N M 240 yards, and M C 460 yards, M B 520 yards, N D 380 yards, draw the figure A B C D to scale, note the lengths of the sides, and determine its area. Supposing that the determination of the positions of M and N are liable to small errors (say of a few feet), why should this cause more of error in the plotted lengths of the sides, than in the calculated area?

8. The angles of a triangle are measured and are found to be 81° 50′, 28° 40′, and 69° 30′, and the shortest side is 520 feet; draw the triangle to scale and calculate the length of the longest side.

9. Describe briefly the method of determining the levels of points along a given line, as along a road. What is a contour line?

EXAMINATION IN BOOK-KEEPING.

MAXIMUM NUMBER OF MARKS, 200. PASS NUMBER, 100.

Friday, April 16th, from 10 *a.m. till* 1 *p.m.*

Journalise and post in proper technical language and form the following imaginary transactions, and draw out from the ledger a "Tri Balance," a "Profit and Loss Account," and a "Balance-sheet."

STATEMENT OF AFFAIRS OF JOHN SQUIRE, 1ST JANUARY, 1880.

Liabilities.

	£	s.
Amount due to Thomas Moxon	305	0
Amount due to Bank for overdraft on current account	1235	6
Amount due to P. Squire for loan	500	0
Balance being surplus	1262	10
	£3302	16

Assets.

	£	s.
Estimated value of Corn unthrashed	951	10
Estimated value of Live Stock	1687	0
Estimated value of Dead Stock	650	0
Balance of Petty Cash	14	6
	£3302	16

1880.						
Jan. 1.	—Sold to John Newham 150 qrs. Corn				375	0
„ 2.	—Sold to Henry James Live Stock				115	0
„ 5.	—Borrowed of P. Squire for 3 months at 5 per cent. and paid into Bank				1500	0
„ 7.	—Drew from Bank for Petty Cash				65	0
„ 9.	—Sold to James Howard 20 qrs. Corn				36	5
„ 11.	—Bought Live Stock of James Gourley, paid him by cheque				680	0
„ 14.	—Sold to Thomas More 55 qrs. Corn				68	15
„ 17.	—Received of John Newham his acceptance due 20th Feb.	£355	0	0		
	And cheque for	20	0	0		
					375	0
„ 18.	—Bought of Thomas More Linseed Cake ..				75	0
„ 19.	—Paid by cheque for Rates and Taxes				14	6
„ 20.	—Received cheque of Thomas More for balance of account, viz., for Wheat sold to him ..	£68	15	0		
	Less Maize purchased from him to-day	26	3	4		
					42	11
„ 21.	—Discounted John Newham's acceptance for £355, receiving cheque for	£344	7	0		
	Charged by Bank for discount	10	13	0		
					355	

					£	s.	d.
1878.							
Jan. 23.	—Sold 50 qrs. Corn and received cheque ..				102	10	0
„ 26.	—Paid by cheque to Thomas Moxon				305	0	0
„ 27.	—Sold to Henry James Live Stock				1020	0	0
„ 28.	—Sent Henry James for his acceptance draft for	£560	0	0			
	Received back from him draft for £560 duly accepted and cash	400	0	0			
					960	0	0
	Paid from Petty Cash for labour				54	14	6
„ 31.	—Interest accrued to date on loan from P. Squire at 5 per cent. on £500 for half-year ..	£12	10	0			
	On £1500 for 26 days	6	5	0			
					18	15	0
	Depreciation of Dead Stock at 5 per cent. per annum				2	14	2
	Estimated value of Corn unthrashed at this date				450	0	0
	Ditto ditto Live Stock				1330	0	0
	Ditto ditto Maize on hand				5	0	0
	Ditto ditto Linseed Cake				53	0	0

EXAMINATION IN GEOLOGY.

Maximum Number of Marks, 100. Pass Number, 50.

Friday, April 16th, from 2 p.m. till 5 p.m.

1. Give the physical characters and approximate chemical composition of six of the chief rock-forming minerals.

2. By what agencies are rocks disintegrated or weathered? Give some examples of the decay of rocks.

3. Tabulate the sub-divisions of the Cretaceous rocks and place alongside their general lithological characters. Name some of the characteristic fossils.

4. What is Boulder clay? Explain its origin. How does it differ from the ordinary clay deposits of the regular stratified rocks?

5. Mention the principal economical substances obtained from the Carboniferous rocks of Great Britain.

6. Upon what formations are the chief clay vales of England situated; and what are their distinctive agricultural characters?

7. What is peat? How has it been formed? Mention the principal occurrences of peat in the British Islands.

8. Define, conglomerate, flagstone, warp, pan, septaria, and explain their origin.

9. How may the geological structure
origin of springs? Mention some good e

10. Give the geological position of the
Gypsum, Alumshale, Kentish rag, Firesto

11. Name some characteristic genera
distinguish the Secondary from the Palæ

12. Name the specimens on the Table.

EXAMINATION IN

[It is expected that Eight Questions at

MAXIMUM NUMBER OF MARKS, 100

Saturday, April 17*th, from* 1

1. Give the characters by which you
animal.

2. What is the function of the e
without epidermis? What part or parts
with epidermis?

3. What is the nature and function o
cell of the leaf?

4. Describe the elements of a vascul
donous stem,—give a diagram.

5. What is the method of the growth o
it differ from the growth of the stem?

6. Give a short account of the life hist

7. What is the nature of the organs i
in the turnip, potato, onion, Kohl-rabi, a

8. Give the technical names and Na
maize, cow-grass, rib-grass, carrot, and t

9. Give the principal characters of the
and specify the plants of this Order grow

10. Name and describe in systematic
A, B, and C.

EXAMINATION IN ANATO
PHYSIOLO

MAXIMUM NUMBER OF MARKS, 100

Saturday, April 17*th, from*

Give a general description of the C
name the [illegible] forces which are emplo

2. State how the heart mechanically assists in passage of the blood as the central organ of the circulation.

3. Name the changes which take place in the blood in the systemic and pulmonic circulation, and say how arteries are to be distinguished from veins.

4. Name the blood vessels which exist in the Fœtal Calf which do not act as carriers of blood after birth, and state the reason of their presence in the fœtus, and their subsequent obliteration.

5. By what means is the birth of a fœtus effected, and in what respect do throes differ from ordinary muscular contractions?

6. Give an example of a voluntary and an Involuntary Muscle, and state the differences to be observed on a microscopic examination of the fibres of each.

MEMORANDA.

Address of Letters.—The Society's office being situated in the postal district designated by letter W. Members, in their correspondence with the Secretary, are requested to subjoin th letter to the usual address.

General Meeting in London, May 22nd, 1880, at 12 o'clock.

Meeting at Derby, July, 1881.

General Meeting in London, December, 1881, at 12 o'clock.

Monthly Council (for transaction of business), at 12 o'clock on the first Wednesday in every mont excepting January, September, and October: open only to Members of Council and Governors the Society.

Adjournments.—The Council adjourn over Passion and Easter weeks, when those weeks do n include the first Wednesday of the month; from the first Wednesday in August to the fi Wednesday in November; and from the first Wednesday in December to the first Wednesday February.

Office Hours.—10 to 4. On Saturdays, 10 to 2.

Diseases of Cattle, Sheep, and Pigs.—Members have the privilege of applying to the Veterina Committee of the Society, and of sending animals to the Royal Veterinary College, Camde Town, N.W.—(A statement of these privileges will be found on page cix in this Appendix.)

Chemical Analysis.—The privileges of Chemical Analysis enjoyed by Members of the Society wi be found stated in this Appendix (page cx).

Botanical Privileges.—The Botanical and Entomological Privileges enjoyed by Members of th Society will be found stated in this Appendix (page cxiii).

Subscriptions.—1. Annual.—The subscription of a Governor is £5, and that of a Member £1, due advance on the 1st of January of each year, and becoming in arrear if unpaid by the 1st June. 2. For Life.—Governors may compound for their subscription for future years by payi at once the sum of £50, and Members by paying £10. Governors and Members who have pa their annual subscription for 20 years or upwards, and whose subscriptions are not in arrea may compound for future annual subscriptions, that of the current year inclusive, by a sing payment of £25 for a Governor, and £5 for a Member.

Payments.—Subscriptions may be paid to the Secretary, in the most direct and satisfactory mann either at the Office of the Society, No. 12, Hanover Square, London, W., or by means of pos office orders, to be obtained at any of the principal post-offices throughout the kingdom, and ma payable to him at the Vere Street Office, London, W.; but any cheque on a banker's or an other house of business in London will be equally available, if made payable on demand. obtaining post-office orders care should be taken to give the postmaster the correct initia and surname of the Secretary of the Society (H. M. Jenkins), otherwise the payme will be refused to him at the post-office on which such order has been obtained; and wh remitting the money-orders it should be stated by whom, and on whose account, they are se Cheques should be made payable as drafts on demand (not as bills only payable after sight or certain number of days after date), and should be drawn on a London (not on a local countr banker. When payment is made to the London and Westminster Bank, St. James's Squa Branch, as the bankers of the Society, it will be desirable that the Secretary should be advis by letter of such payment, in order that the entry in the banker's book may be at once ide tified, and the amount posted to the credit of the proper party. No coin can be remitted by po unless the letter be registered.

New Members.—Every candidate for admission into the Society must be proposed by a Memb the proposer to specify in writing the full name, usual place of residence, and post-town, of candidate, either at a Council meeting, or by letter addressed to the Secretary. Forms of Propo may be obtained on application to the Secretary.

Members may obtain on application to the Secretary copies of an Abstract of the Cha and Bye-laws, of a Statement of the General Objects, &c., of the Society, of Chem Botanical, and Veterinary Privileges, and of other printed papers connected with sp departments of the Society's business.

Members' Veterinary Privileges.

I.—VISITS OF THE VETERINARY INSPECTOR.

1. Any Member of the Society who may desire professional attendance and special advice in cases of disease among his cattle, sheep, or pigs, should apply to the Secretary of the Society, or to the Principal of the Royal Veterinary College, and Consulting Veterinary Surgeon, Camden Town, London, N.W.

2. The remuneration of the Consulting Veterinary Surgeon or Inspector will be 2*l.* 2*s.* each day as a professional fee, and the charge for personal expenses, *when such have been incurred*, will in no cases exceed one guinea per diem. He will also be allowed to charge the cost of travelling to and from the locality where his services may have been required. These charges may, however, in cases of serious or extensive outbreaks of contagious disease, be reduced or remitted altogether, so far as the Members of the Society are concerned, at the discretion of the Council, on such step being recommended to them by the Veterinary Committee.

3. The Inspector, on his return from visiting the diseased stock, will report to the Member, and, through the Principal of the Royal Veterinary College, to the Committee, in writing, the results of his observations and proceedings, which Report will be laid before the Council.

4. When contingencies arise to prevent a personal discharge of the duties, the Consulting Veterinary Surgeon may, subject to the approval of the Committee, name some competent professional person to act in his stead, who shall receive the same rates of remuneration.

II.—CONSULTATIONS WITHOUT VISIT.

Personal consultation with Veterinary Inspector	10*s.* 6*d.*
Consultation by letter	10*s.* 6*d.*
Post-mortem examination, and report thereon	21*s.*

A return of the number of applications from Members of the Society during each half-year is required from the Veterinary Inspector.

III.—ADMISSION OF DISEASED ANIMALS TO THE ROYAL VETERINARY COLLEGE, CAMDEN TOWN, N.W.; INVESTIGATIONS AND REPORTS.

1. All Members of the Society have the privilege of sending cattle, sheep, and pigs to the Infirmary of the Royal Veterinary College, on the following terms; viz., by paying for the keep and treatment of cattle 10*s.* 6*d.* per week each animal, and for sheep and pigs, 3*s.* 6*d.* per week.

No. 2. A detailed Report of the cases of cattle, sheep, and pigs treated in the Infirmary of the College or on Farms in the occupation of Members of the Society, will be furnished to the Council quarterly; and also special reports from time to time on any matter of unusual interest which may come under the notice of the Officers of the College

By Order of the Council,

H. M. JENKINS, *Secretary.*

Members' Privileges of Chemical Analysis

(Applicable only to the case of Persons who are not commercially engaged in the manufacture or sale of any substance sent for Analysis).

The Council have fixed the following rates of Charges for Analysis to be made by the Consulting Chemist for the *boná-fide* and sole use of Members of the Society; who, to avoid all unnecessary correspondence, are particularly requested, when applying to him, to mention the kind of analysis they require, and to quote its number in the subjoined schedule. The charge for analysis, together with the carriage of the specimens (if any), must be paid to him by Members at the time of their application:

No. 1.	An opinion of the genuineness and value of bone-dust or oil-cake (each sample)	5s.
" 2.	An estimate of the value (relatively to the average samples in the market) of sulphate and muriate of ammonia and of the nitrate of potash and soda	5s.
" 3.	An analysis of guano; showing the proportion of moisture, organic matter, sand, phosphate of lime, alkaline salts and ammonia, and an estimate of its value, provided the selling price of the article to be analysed be sent with it	10s.
" 4.	An analysis of mineral superphosphate of lime for soluble phosphates only, and an estimate of its value, provided the selling price of the article to be analysed be sent with it	5s.
" 5.	An analysis of superphosphate of lime, showing the proportions of moisture, organic matter, sand, soluble and insoluble phosphates, sulphate of lime, and ammonia, and an estimate of its value, provided the selling price of the article to be analysed be sent with it	10s.
" 6.	An analysis, showing the value of any ordinary artificial manure	10s.
" 7.	An analysis of limestone, showing the proportion of lime	7s. 6d.
" 8.	An analysis of limestone, showing the proportion of magnesia, 10s.; the proportion of lime and magnesia	10s.
" 9.	An analysis of limestone or marls, showing the proportion of carbonate, phosphate, and sulphate of lime and magnesia, with sand and clay	10s.
" 10.	Partial analysis of a soil, including determinations of clay, sand, organic matter, and carbonate of lime	10s.
" 11.	Complete analysis of a soil	£3
" 12.	An analysis of oil-cake or other substance used for feeding purposes, showing the proportion of moisture, oil, mineral matter, albuminous matter, and woody fibre, as well as of starch, gum, and sugar in the aggregate; and an estimate of its value as compared with pure linseed-cake	10s.
" 13.	Analysis of any vegetable product	10s.
" 14.	Analysis of animal products, refuse substances used for manures, &c.	from 10s. to £1
" 15.	Determination of the "hardness" of a sample of water before and after boiling	5s.
" 16.	Analysis of water of land-drainage, and of water used for irrigation	£1
" 17.	Analysis of water used for domestic purposes	£1 10s.
" 18.	Determination of nitric acid in a sample of water	10s.
" 19.	Personal consultation with the Consulting Chemist. (The usual hours of attendance for the Director, Monday excepted, will be from 11 to 2, but to prevent disappointment, it is suggested that members desiring to hold a consultation with the Director should write to make an appointment)	5s.
" 20.	Consultation by letter	5s.
" 21.	Consultation necessitating the writing of three or more letters	10s.

The Laboratory of the Society is at 12, Hanover Square, London, W., to which address the Consulting Chemist, Dr. Augustus Voelcker, F.R.S., requests that all letters and parcels (postage and carriage paid) from Members of the Society, who are entitled to avail themselves of the foregoing Privileges, should be directed.

GUIDE TO THE PURCHASE OF ARTIFICIAL MANURES AND FEEDING STUFFS.

FEEDING CAKES.

1. *Linseed-cake* should be purchased as "Pure," and the insertion of this word on the invoice should be insisted upon. The use of such words as "Best," "Genuine," &c., should be objected to by the purchaser.

2. *Rape-cake for feeding purposes* should be guaranteed "Pure" and purchased by sample.

3. *Decorticated Cotton-cake* should be guaranteed "Pure," and purchased by sample.

4. *Undecorticated Cotton-cake* should be guaranteed "Pure," and purchased by sample.

N.B.—All feeding cakes should be purchased in good condition, and the guarantee of the vendor should be immediately checked by a fair sample (taken out of the middle of the cake) being at once sent for examination to a competent analytical chemist. The remainder of the cake from which the sample sent for examination had been taken should be sealed up in the presence of a witness, and retained by the purchaser for reference in case of dispute.

ARTIFICIAL MANURES.

1. *Raw or Green Bones or Bone-dust* should be purchased as "Pure" Raw Bones guaranteed to contain not less than 45 per cent. of tribasic phosphate of lime, and to yield not less than 4 per cent. of ammonia.

2. *Boiled Bones* should be purchased as "Pure" Boiled Bones guaranteed to contain not less than 48 per cent. of tribasic phosphate of lime, and to yield not less than 1¾ per cent. of ammonia.

3. *Dissolved Bones* are made of various qualities, and are sold at various prices per ton; therefore the quality should be guaranteed, under the heads of *soluble* phosphate of lime, *insoluble* phosphate of lime, and nitrogen or its equivalent as ammonia. The purchaser should also stipulate for an allowance for each unit per cent. which the dissolved bones should be found on analysis to contain less than the guaranteed percentages of the three substances already mentioned.

4. *Mineral Superphosphates* should be guaranteed to be delivered in a sufficiently dry and powdery condition, and to contain a certain percentage of *soluble* phosphate of lime, at a certain price per unit per cent., no value to be attached to *insoluble* phosphates.

5. *Compound Artificial Manures* should be purchased in the same manner and with the same guarantees as Dissolved Bones.

6. *Nitrate of Soda* should be guaranteed by the vendor to contain from 94 to 95 per cent. of pure nitrate.

7. *Sulphate of Ammonia* should be guaranteed by the vendor to contain not less than 23 per cent. of ammonia.

8. *Peruvian Guano* should be sold under that name, and guaranteed to be in a dry and friable condition, and to contain a certain percentage of ammonia.

N.B.—Artificial manures should be guaranteed to be delivered in a sufficiently dry and powdery condition to admit of distribution by the drill. A sample for analysis should be taken, not later than three days after delivery, by emptying several bags, mixing the contents together, and filling two tins holding about half a pound each, in the presence of a witness. Both the tins should be sealed, one kept by the purchaser for reference in case of dispute, and the other forwarded to a competent analytical chemist for examination.

INSTRUCTIONS FOR SELECTING AND SENDING SAMPLES FOR ANALYSIS.

ARTIFICIAL MANURES.—Take a large handful of the manure from thre or four bags, mix the whole on a large sheet of paper, breaking down with th hand any lumps present, and fold up in tinfoil, or in oil silk, about 3 oz. of th well-mixed sample, and send it to 12, HANOVER SQUARE, LONDON, W., by post: or place the mixed manure in a small wooden or tin box, which may be tied b string, but must not be sealed, and send it by post. If the manure be very we and lumpy, a larger boxful, weighing from 10 to 12 oz., should be sent eithe by post or railway.

Samples not exceeding 4 oz. in weight may be sent by post, by attaching tw penny postage stamps to the parcel.

Samples not exceeding 8 oz., for three postage stamps.

Samples not exceeding 12 oz., for four postage stamps.

The parcels should be addressed: DR. AUGUSTUS VOELCKER, 12, HANOVE SQUARE, LONDON, W., and the address of the sender or the number or mark o the article be stated on parcels.

The samples may be sent in covers, or in boxes, bags of linen or other materials No parcel sent by post must exceed 12 oz. in weight, 1 foot 6 inches in length 9 inches in width, and 6 inches in depth.

SOILS.—Have a wooden box made 6 inches long and wide, and from 9 to 1 inches deep, according to the depth of soil and subsoil of the field. Mark out in th field a space of about 12 inches square; dig round in a slanting direction a trench so as to leave undisturbed a block of soil with its subsoil from 9 to 12 inches deep trim this block or plan of the field to make it fit into the wooden box, invert th open box over it, press down firmly, then pass a spade under the box and lift i up, gently turn over the box, nail on the lid and send it by goods or parcel to th laboratory. The soil will then be received in the exact position in which it i found in the field.

In the case of very light, sandy, and porous soils, the wooden box may be a once inverted over the soil and forced down by pressure, and then dug out.

WATERS.—Two gallons of water are required for analysis. The water, i possible, should be sent in glass-stoppered Winchester half-gallon bottles, whic are readily obtained in any chemist and druggist's shop. If Winchester bottle cannot be procured, the water may be sent in perfectly clean new stoneware spiri jars surrounded by wickerwork. For the determination of the degree of hardne before and after boiling, only one quart wine-bottle full of water is required.

LIMESTONES, MARLS, IRONSTONES, AND OTHER MINERALS.— Whole pieces, weighing from 3 to 4 oz., should be sent enclosed in small line bags, or wrapped in paper. Postage 2*d.*, if under 4 oz.

OILCAKES.—Take a sample from the middle of the cake. To this end break whole cake into two. Then break off a piece from the end where the two halv were joined together, and wrap it in paper, leaving the ends open, and send parc by post. The piece should weigh from 10 to 12 oz. Postage, 4*d.* If sent b railway, one quarter or half a cake should be forwarded.

FEEDING MEALS.—About 3 oz. will be sufficient for analysis. Enclose t meal in a small linen bag. Send it by post.

In forwarding samples, separate letters should be sent to the laborato specifying the nature of the information required, and, if possible, the obj in view.

H. M. JENKINS, *Secretary*

Members' Botanical and Entomological Privileges.

The Council have fixed the following Rates of Charge for the examination of Plants, Seeds, and Insects for the *bonâ-fide* use of Members of the Society, who are particularly requested, when applying to the Consulting Botanist, to mention the kind of examination they require, and to quote its number in the subjoined Schedule. The charge for examination must be paid to the Consulting Botanist at the time of application, and the carriage of all parcels must be prepaid.

I. BOTANICAL.

No. 1.	—A report on the purity, amount and nature of foreign materials, perfectness, and germinating power of a sample of seeds	5*s.*
„ 2.	—Detailed report on the weight, purity, perfectness, and germinating power of a sample of seeds, with a special description of the weeds and other foreign materials contained in it	10*s.*
„ 3.	—Determination of the species of any weed or other plant, or of any epiphyte or vegetable parasite, with a report on its habits, and the means of its extermination or prevention	5*s.*
„ 4.	—Report on any disease affecting the farm crop	5*s.*
„ 5.	—Determination of the species of a collection of natural grasses found in any district on one kind of soil, with a report on their habits and pasture value	10*s.*

II. ENTOMOLOGICAL.

„ 6.	—Determination of the species of any insect, worm, or other animal which, in any stage of its life, injuriously affects the farm crops, with a report on its habits and suggestions as to its extermination	5*s.*

INSTRUCTIONS FOR SELECTING AND SENDING SPECIMENS.

In sending seed or corn for examination the utmost care must be taken to secure a fair and honest sample. If anything supposed to be injurious or useless exists in the corn or seed, selected samples should also be sent.

In collecting specimens of plants, the whole plant should be taken up, and the earth shaken from the roots. If possible, the plant must be in flower or fruit. They should be packed in a light box, or in a firm paper parcel.

Specimens of diseased plants or of parasites should be forwarded as fresh as possible. Place them in a bottle, or pack them in tin-foil or oil-silk.

All specimens should be accompanied with a letter specifying the nature of the information required, and stating any local circumstances (soil, situation, &c.) which, in the opinion of the sender, would be likely to throw light on the inquiry.

N.B.—*The above Scale of Charges is not applicable in the case of Seedsmen requiring the services of the Consulting Botanist.*

Parcels or letters (Carriage or Postage prepaid) to be addressed to Mr. W. Carruthers, F.R.S., 4, Woodside Villas, Gipsy Hill, London, S.E.

H. M. JENKINS, ***Secretary.***

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This, though not sold as a *pure* Dissolved Bone, is an exceedingly ri well prepared Manure, containing about 32 per cent. total Phosphates, from 24 Soluble, and 1½ per cent. Ammonia. A large portion of Raw Bone is in an undissolved state, but the whole becomes available and useful in th stages of the growth of the plant.

SUPERPHOSPHATES are supplied at prices regulated by the am Soluble Phosphate present. The ordinary quality contains from 25 to 28 per

Special Manures for Barley.

And all Corn Crops, Hops, Turnips, Potatoes, Mangold, &c. Also fo

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Guaranteed to contain 9 per cent. of Ammonia, 20 to 22 per cent. Soluble Pho 2 to 4 per cent. Insoluble, with Magnesia and Potash Salts. It is in fine co for drilling, and is sent out in 1¼ cwt. bags, 16 to the ton.

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Hopewell, Tarland, Aberdeenshire,
14th November, 1877.

Messrs. Hill and Smith,
Brierley-Hill, Staffordshire.

Gentlemen,—I have much pleasure in stating that the "Patent Continuous Iron Fencing" supplied by you 17 years ago for Her Majesty's grounds at Balmoral, has given every satisfaction, both as to style and workmanship.

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GOLD MEDAL.

We are also offering HIGH-CLASS PHOSPHATIC MANURES, such as

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All with Guaranteed Analysis; and also various

Special Manures,

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NITRATE OF SODA, SULPHATE OF AMMONIA;
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Invaluable for Horses, Dairy Cows, Cattle, and all Stock, and for imparting an aromatic flavour to Weathered Hay and Damaged Corn. It contains no Fenugreek or Minerals, but pure Herbs, Roots, Barks, and Seeds only, and may herefore be given or discontinued at any time. It keeps all Animals in good health, and is the strongest, heapest, and best Flavourer in the market (costs under one farthing per feed for Horse or Cow).

Price 30s. per Cwt. (Cash with Order, less 1s.)

CARRIAGE PAID TO ANY STATION.

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A Cooked Food, and complete substitute for Milk, for Calves and Young Animals. It requires no boiling, and is the only milk substitute containing dried milk. Costs, when made, under one penny halfpenny per gallon.

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The CONTRACT of Messrs. DREYFUS BROS. & Co. having **CEASE** they, their Agents, MESSRS. J. H. SCHRODER & CO., and their local Sub-Age **NO LONGER** represent the Government of Peru.

THE PERUVIAN GUANO COMPANY (LIMITED) **ALONE**, and no ot persons, firms, or companies are the Agents for the Sale of Peruvian Governm Guano, the price of which is fixed strictly on Analysis made from each cargo DR. AUG. VOELCKER, Chemist of the Royal Agricultural Society of England.

The Cargoes are Sampled by the Dock Companies, or Sworn Weighers, in presence of a representative of the Peruvian Fiscal Inspection. Every facility be given for inspecting cargoes. Official Analysis of each Cargo by DR. AU VOELCKER, and all further particulars may be obtained on application to—

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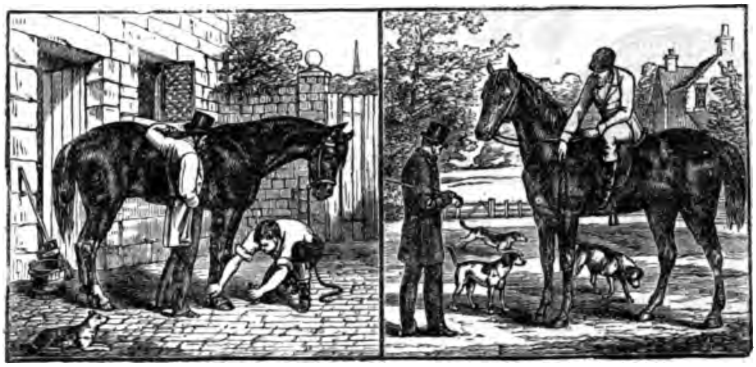

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From His Grace the Duke of Rutland, Master of the Belvoir Hunt, Belvoir, Grantham, Dec. 1, 1879.
"Sirs,—Elliman's Royal Embrocation is used in my stables; I think it very useful. Rutland."

From Messrs. Chaplin & Horne, the London Carriers, September 12, 1863.
"Sir,—Please to forward us, at your earliest convenience, four dozen of your Royal Embrocation; we are well satisfied with its efficacy.—Yours respectfully, Chaplin and Horne."

From Major J. M. Browne, Master of South Staffordshire Hounds, Fooseway, Lichfield, Oct. 17, 1879.
"Sirs,—I find Elliman's Embrocation exceedingly good for sprains and cuts in horses, and also for cuts in hounds' feet. I shall strongly recommend it to all my friends.—Yours faithfully, J. M. Browne."

From Rees Williams, Esq., Master of the Breconshire Harriers, Aberyskir Conrt, Brecon, Sept. 25, 1879.
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"Rees Williams."

From J. Bellamy, Esq., Master of the Isle of Wight Hunt, December, 1878.
"Sirs,—I use Elliman's Royal Embrocation, and have found it most efficacious in many cases of sprains and wounds, but especially for sore throats; and when used with bandage as a mild blister.
"J. Bellamy."

From Phillip Hilton, Esq., Master of the Hundred of Hoo Harriers, Rochester, Sept. 27, 1879.
"Sirs,—Elliman's Royal Embrocation is used in my stables, and I very much approve of it.
"Phillip Hilton."

From Joseph Nall & Co., Manchester, Agents for the Lancashire and Yorkshire Railway Company.
"63, Corporation Street, December 26, 1876.
"Gentlemen,—Please to supply us with another dozen bottles (large size) of your Royal Embrocation. We have found what you sent us in July last very useful and effectual.—Yours truly,
"Joseph Nall & Co."

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"Gentlemen,—I use the Royal Embrocation in the stables and kennels, and have found it very serviceable. I have also used the Universal Embrocation for Lumbago and Rheumatism for the last two years, and have suffered very little since using it.
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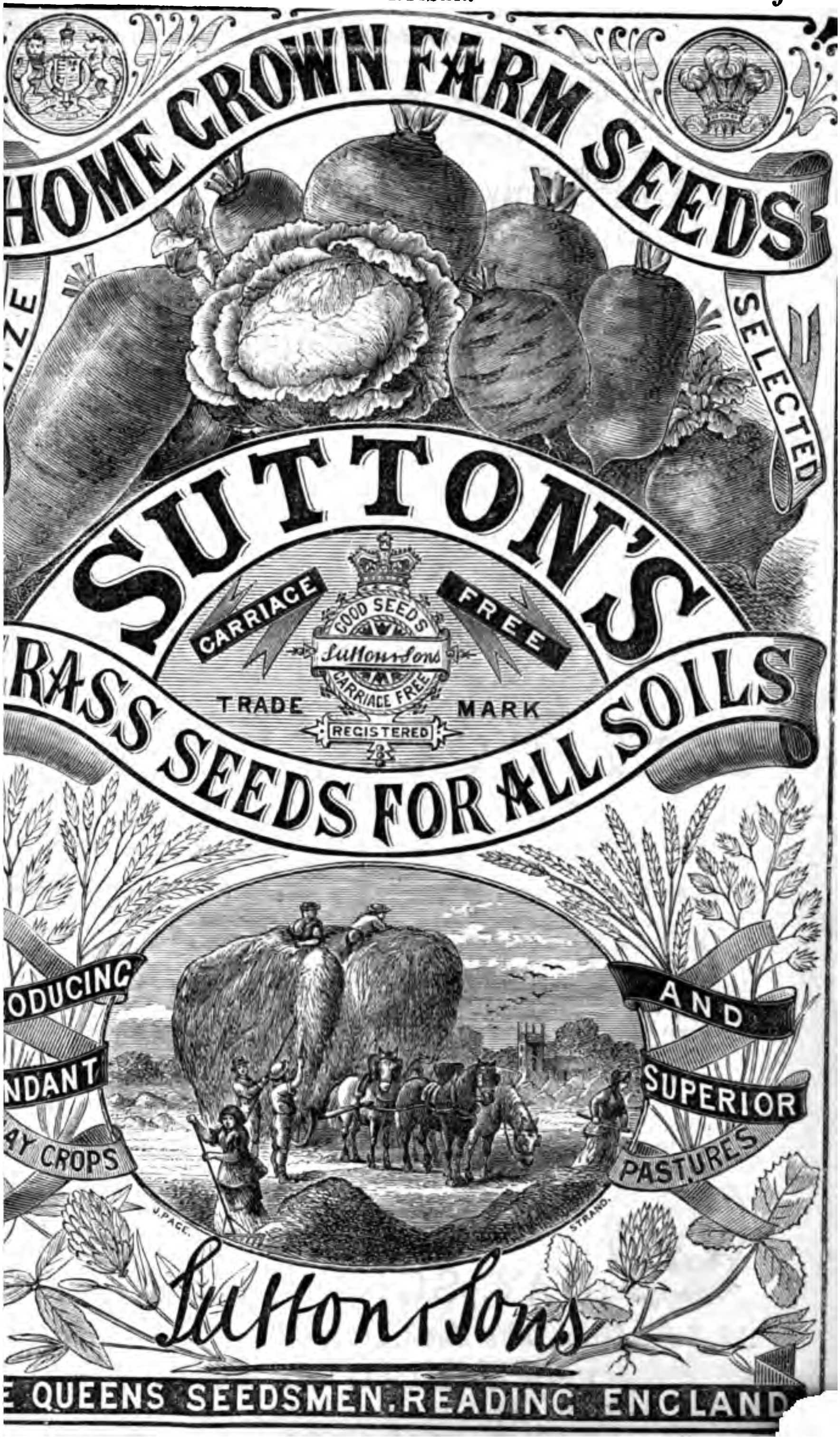
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ARE THE MOST RELIABLE & PERFECT MACHINES MADE.

Awarded 30 First Prizes in 1879
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Over 25,000 Sold in Europe alone.

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15,000 Made and Sold.

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Machines have been
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NEW REAPER,
with 5 Controllable Rakes, in which every 2nd, 3rd, 4th, or 5th Rake can be set to deliver automatically.

NEW REAPER,
with 4 fixed Rakes; also with 4 Controllable Rak
Simple, Strong, and Reliable.

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NEW AUTOMATIC STRING-BINDER

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This Binder is perfectly Automatic, the Sheaf is compressed, bound, and dischar without any action on the part of the driver. The Sheaves are securely tied, gently deposited at the side of the Binder.

THE FIRST PRIZE was awarded to the **NEW STRING-BINDER** in c petition with seven Machines at Dunedin, New Zealand, February 10th, 1880.

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UNDER THE SPECIAL PATRONAGE OF HER MAJESTY THE QUEEN.

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Has stood the test of upwards of 40 years, and is acknowledged to be the safest and most effectual

DRESSING FOR SEED WHEAT, BARLEY, OATS, &

FOR THE

PREVENTION OF SMUT,

AND RAVAGES OF THE SLUG, GRUB, AND WIRE-WO

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**From the Steward to HER MAJESTY THE QUEEN, of the Prince Consort
Shaw Farm, Windsor.**

The Prince Consort's Shaw Farm, May 26, 187

SIR,—I have for the past 15 years used Down's Farmers' Friend as a dressing for seed wheat.
a certain preventive of smut, and deserves to be universally used.

Yours, &c., HENRY TAI

From the Bailiff of H.R.H. the PRINCE OF WALES.

Sandringham, March 18th, 187

SIR,—I have used Down's Farmers' Friend as a dressing for seed wheat on the Royal Farm f
last 10 years, and it affords me pleasure to state I have invariably found it a certain preventive of
and I am perfectly satisfied there is no other dressing to equal it.

I am your obedient servant, JOHN HIGH

Bethersden, Ashford, Kent, September 6th, 1

GENTLEMEN,—Wheat, as you know, is my specialité, and I have now heads 7½ inches long, w
rows on a side, and I recommend your Down's Farmers' Friend as the only safe remedy for rust, c
smut, or bunt. I have used brine and lime, bluestone, &c., &c, and all have failed, as my la
subject to it; but by using Down's Farmers' Friend, 4 bushels to a packet instead of 6, I have
entirely free this 6 years. I should like to send a sheet stating this with every invoice of whea
the benefit of my friends, for it is the only remedy I know, and the carbolising prevents rooks and
taking it effectually.

I am, yours truly, W. H. MOI

CAUTION.—Each Packet of the FARMERS' FRIEND bears a *fac-simile* of the Inventor's Signature.

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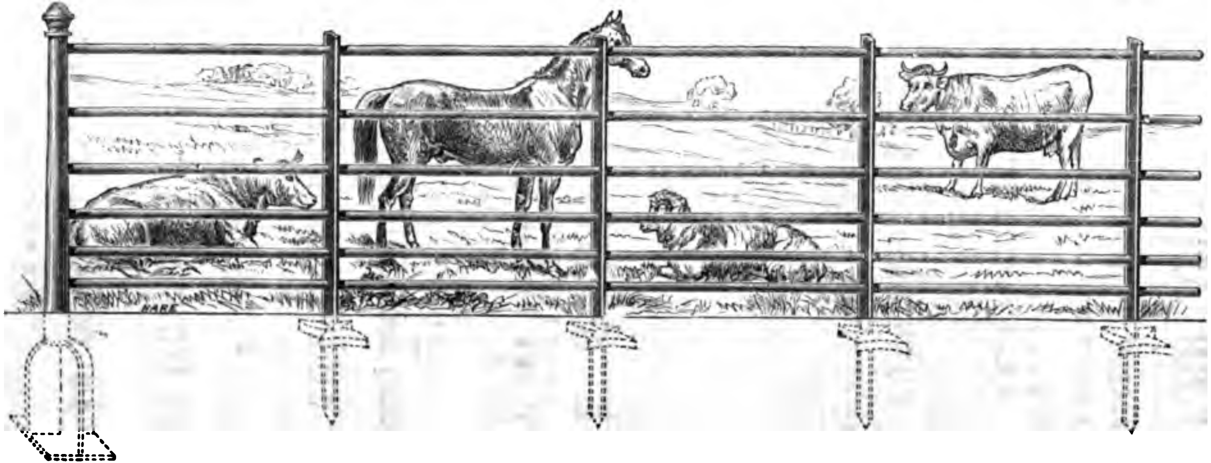

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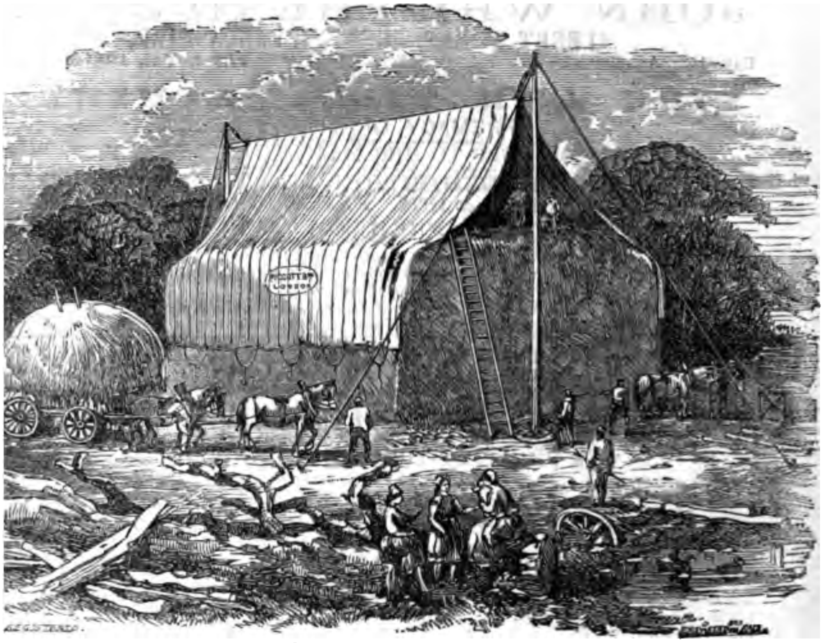

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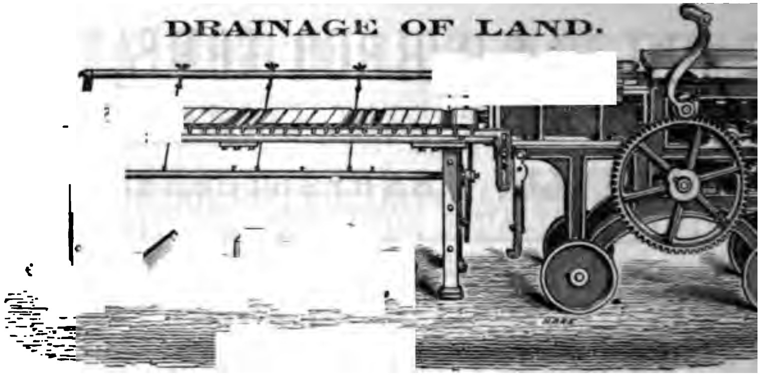

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Turkeys, Geese, Ducks, and Chickens fed on this Meal thrive wonderfully, are kept free from
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Turkeys, so difficult to breed, are reared with the greatest success upon this Meal with sc
loss of three per cent. If shut up they will fatten in a very short time, and the colour and deli
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"SIR—I had wonderful luck with my turkeys this year, having reared over 400 turkeys and
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"I am, yours respectfully, CHAS. HA

Price 24s per cwt., including 12 Packets of Aromatic Compound and Bag, less 4s. p
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It is not affected by heat, and completely resists the action of Sulphide of Hydrogen, and other poisonous gases, and is therefore PERMANENT.

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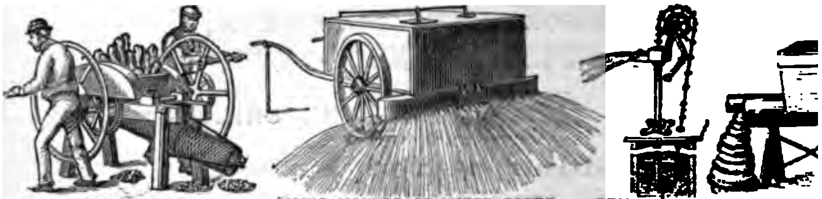
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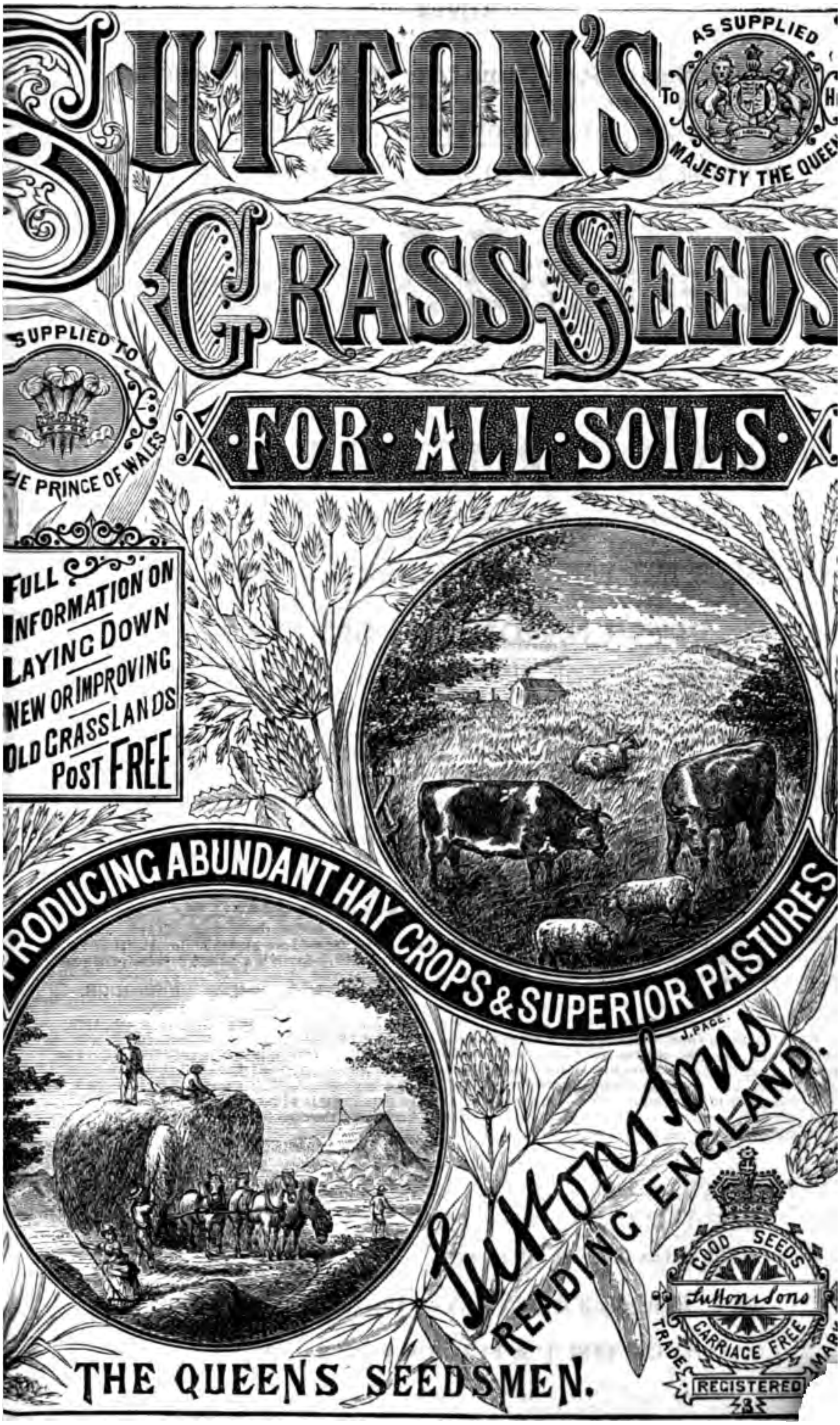

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From the Steward to HER MAJESTY THE QUEEN, of the Prince Consort's Shaw Farm, Windsor.

The Prince Consort's Shaw Farm, May 28, 1874.

SIR,—I have for the past 15 years used Down's Farmers' Friend as a dressing for seed wheat. a certain preventive of smut, and deserves to be universally used.

Yours, &c., HENRY TAIT.

From the Bailiff of H.R.H. the PRINCE OF WALES.

Sandringham, March 18th, 1874.

SIR,—I have used Down's Farmers' Friend as a dressing for seed wheat on the Royal Farm for last 10 years, and it affords me pleasure to state I have invariably found it a certain preventive of sm and I am perfectly satisfied there is no other dressing to equal it.

I am your obedient servant, JOHN HIGE.

Bethersden, Ashford, Kent, September 6th, 187

GENTLEMEN,—Wheat, as you know, is my specialité, and I have now heads 7¼ inches long, wit rows on a side, and I recommend your Down's Farmers' Friend as the only safe remedy for rust, coc smut, or bunt. I have used brine and lime, bluestone, &c., &c., and all have failed, as my lan subject to it; but by using Down's Farmers' Friend, 4 bushels to a packet instead of 6, I have b entirely free this 6 years. I should like to send a sheet stating this with every invoice of wheat, fo benefit of my friends, for it is the only remedy I know, and the carbolising prevents rooks and b taking it effectually.

I am, yours truly, W. H. MOL

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